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TM 9-1430-253-12/4

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

RADAR COURSE DIRECTING CENTRAL

(IMPROVED NIKE-HERCULES AIR DEFENSE GUIDED MISSILE SYSTEM) (U)

This copy is a reprint which includes current pages from Changes 1 through 10. Pages applying to all systems are inserted in proper numerical order in the manual. Pages which have different effectivities are inserted in the front of the manual. Read the instructions concerning these pages before using the manual.

This material contains information affecting the National Defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

HEADQUARTERS, DEPARTMENT OF THE ARMY

MARCH 1964

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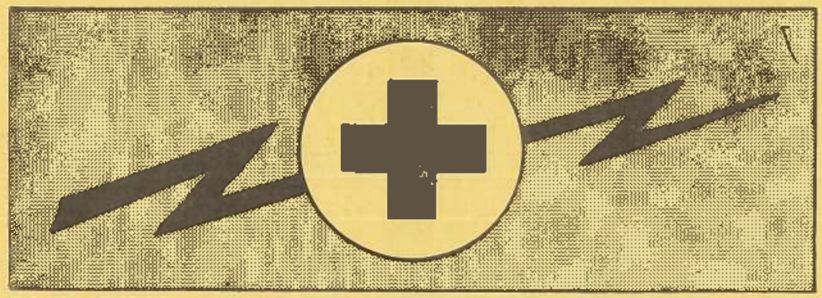
DOWNGRADED AT 12 YEAR INTERVALS;
NOT AUTOMATICALLY DECLASSIFIED.
DOD DIR 5200.10

WARNING



RA PD 404264

HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT

may result if personnel fail to observe safety precautions

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections or 115-volt ac input connections when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

EXTREMELY DANGEROUS POTENTIALS

greater than 500 volts exists in the following units.

Auxiliary acquisition control interconnecting
  group LOPAR auxiliary control-indicator
Battery control console
  PPI
  PPI HV power supply
  Precision indicator
Director station group
  −1000v power supply
  Acquisition power control panel

READ THESE INSTRUCTIONS CAREFULLY

1 (U). These instructions provide a listing of those pages held in front of this manual because of MWO and production cut-in serial number effectivity.

2 (U). If the equipment in use has had the applicable MWO applied or is the applicable production cut-in serial number or higher, remove and destroy the old pages in accordance with security regulations and insert the following new pages. New or changed text material is identified on these pages by a vertical line in the page margin. New or changed illustrations are identified by a vertical line adjacent to the illustration file number. Extensively changed or added sections, paragraphs, etc., are indicated by a vertical line by the title only.

		Effectivity	
Remove pages	Insert pages	MWO	Production cut-in serial no.
1,2	1,2	9-1430-251-30/39	317
11,12	11,12 (C4)	9-1400-250-30/40	205
11,12	11,12 (C8)	9-1430-251-30/31	317
13,14	13,14 (C4)	9-1400-250-30/40	205
13,14	13,14 (C8)	9-1430-251-30/39	317
17 - 20	17 - 20, 20.1	9-1430-251-30/39	317
21,22	21,22	9-1400-250-30/51	289
35,36	35,36	9-1430-251-30/39	317
39,40	39,40	9-1430-251-30/37	K317
67,68	67,68	9-1400-250-30/51	289
81-84	81-84	9-1430-251-30/39	317
85,86	85,86	9-1430-251-30/37	K317
99,100,100.1	99, 100 100.1-100.3	9-1430-251-30/37	K317
127,128	127,128	9-1400-250-30/51	289
156.1	156.1, 156.2	9-1430-251-30/37	K317
173,174	173,174,174.1	9-1400-250-30/51	289
183,184	183.184	9-1430-252-30/2/20	INH Kit 311
217-220	217-220	9-1430-254-30/1/8	K317
229,230	229,230	9-1430-251-30/37	K317
231,232	231,232	9-1430-251-30/39	317
233,234	233,234	9-1400-250-30/40	205
243-246	243-246,246.1	9-1400-250-30/51	289
279-284	279-284, 284.1	9-1430-251-30/37	K317
309,310	309,310	9-1430-251-30/39	317
315,316	315,316	9-1400-250-30/51	289
331,332	331,332	9-1400-250-30/40	205
349-256	349-256	9-1430-253-50/2	1386 and 138

TM 9-1430-253-12/4

3 (U). Pages 401 through 404 were rescinded by change 5.

4 (U). The group classification was changed to group III by change 5.

5 (U). This instruction sheet should be filed in the front of the publication for reference purposes.

TECHNICAL MANUAL No. 9-1430-253-12/4

HEADQUARTERS, DEPARTMENT OF THE ARMY
WASHINGTON, D. C.,

RADAR COURSE DIRECTING CENTRAL (U)

***This manual supersedes TM 9-1430-250-10/2, 4 April 1961; change 1, 25 July 1961; change 2, 29 August 1961; change 3, 13 November 1961; change 4, 21 May 1962; change 5, 11 September 1962; change 6, 28 November 1962; change 7, 19 June 1963; change 8, 18 September 1963; and TM 9-1430-253-20/2, 8 February 1961; change 1, 6 June 1961; change 2, 12 September 1961; change 3, 13 September 1961; change 4, 12 April 1962; change 5, 29 November 1962. This manual also supersedes paragraphs 1 through 3 of TB 9-1400-250-20/3, 10 July 1963.**

TECHNICAL MANUAL No. 9-1430-253-12/4

HEADQUARTERS, DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 25 March 1964

RADAR COURSE DIRECTING CENTRAL (U)

***This manual supersedes TM 9-1430-250-10/2, 4 April 1961; change 1, 25 July 1961; change 2, 29 August 1961; change 3, 13 November 1961; change 4, 21 May 1962; change 5, 11 September 1962; change 6, 28 November 1962; change 7, 19 June 1963; change 8, 18 September 1963; and TM 9-1430-253-20/2, 8 February 1961; change 1, 6 June 1961; change 2, 12 September 1961; change 3, 13 September 1961; change 4, 12 April 1962; change 5, 29 November 1962. This manual also supersedes paragraphs 1 through 3 of TB 9-1400-250-20/3, 10 July 1963.**

WARNING

Toxic solvents are used in servicing the equipment. Safety measures described below should be observed in the handling and use of these solvents.

When using trichloroethane be sure that area is well ventilated as fumes are toxic. Rapid evaporation of trichloroethane has a drying irritating effect on the skin. The use of gloves is advised to prevent this irritation or inflammation of the skin. If contact occurs, quickly wash the affected parts with a soap solution, rinse, and dry thoroughly.

WARNING

RADIO-FREQUENCY RADIATION HAZARD

Radio-frequency radiations from radar antennas and associated equipment could present a potential hazard to battery personnel. The effect of RF radiation is not cumulative, but it could be hazardous. RF radiation heats the body tissues. When the intensity is high, the radiation may produce enough heat to damage the tissues permanently. Damage to the body is not immediately apparent. Precautions should be taken to insure that personnel are not exposed to RF radiations of hazardous intensity levels.

A power level of 10 milliwatts per square centimeter, although not considered potentially hazardous, is stipulated by AR 40-583 as the maximum permissible exposure level for personnel subjected to RF radiation fields. Personnel should not be permitted to enter areas where they may be exposed to levels above 10 milliwatts per square centimeter.

A power intensity of 10 milliwatts per square centimeter is present along the axis of the transmitted beam at the following distances from Improved NIKE-HERCULES radar antennas. In each instance, the intensity rapidly diminishes as the distance is increased.

ANTENNA	DISTANCE
Radar Set AN/MPQ-43 — Non Rotating	430 feet
Radar Set AN/MPQ-43 — Rotating	33 feet
High Power Acquisition Radar — Non Rotating	430 feet
High Power Acquisition Radar — Rotating	33 feet
Low Power Acquisition Radar — Non Rotating	125 feet
Missile Tracking Radar — NIKE-AJAX Mode	255 feet
Target Tracking Radar — Long Pulse Mode	355 feet

Transmitting antennas in the non-scanning mode should not be positioned so as to radiate into areas occupied by passive antennas. The resulting reflections may present a potential hazard to personnel working in the vicinity of the passive antennas.

The intensity of the beam from the target tracking radar in the narrow pulse mode, from the low power acquisition radar when rotating, from the missile tracking radar in the NIKE-HERCULES mode, and from the target ranging radar is inconsequential under operating conditions.

Access to the Radar Set AN/MPQ-43 antenna trailer and the roofs of the equipment vans should be prohibited during periods of radar operation.

This information is based upon average power outputs and may be used as a guide to prevent radio-frequency radiation hazards.

Acquisition HV power supply
MTI oscilloscope
LOPAR antenna-receiver-transmitter group
Acquisition modulator
Acquisition receiver-transmitter
Radar power supply group
Target radar control console
Azimuth indicator
B scope indicator
Countermeasures control-indicator
Elevation indicator
Power supply assembly
Range indicator
Target Track control-power supply
Target range antenna-receiver-transmitter group
+2.5 kv power supply
Range receiver-transmitter
Range slip ring assembly
Target range antenna-receiver-transmitter
Target ranging radar console
Test scope
Target track antenna-receiver-transmitter group
Rectifier power supply assembly
Target track antenna-receiver-transmitter
Target track trigger amplifier
Target slip ring assembly
Transformer and filter power supply subassembly

***Warning*: Potentials less than 500 volts may cause death under certain conditions. Reasonable precautions should be taken at all times.**

For artificial respiration, refer to FM 21–11.

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RADIATION HAZARD

This equipment contains the following radioactive tubes:

ATR 5921	6626	OB24WA
ATR 5922	5651	5829
ATR 5922/428	5651WA	OC3
TR 6164/429	OA2	
TR 5927	OA2WA	
6167	OB2	
395A	OB2WA	

Refer to TM 38-250, AR 755-380, and AR 55-55 for safety information relative to shipping, storage, handling, and disposal of radioactive tubes.

FIRST AID FOR RADIOACTIVE CONTACT

The following first aid procedure for wounds caused by anything coated with a radioactive material represents the only reasonable first aid treatment which would possibly be available.

a. Stimulation of mild bleeding by normal pressure about the wound and by use of suction cups.

Warning: **Do not suck the wound by mouth. The wound must be washed with soap and flushed with plenty of clear water.**

b. If the wound is of the puncture type, or the opening is quite small, an incision should be made to promote free bleeding and to facilitate cleaning and flushing of the wound.

c. Evacuate patient to a medical facility where monitoring of the wound can be accomplished. All such wounds should be examined by a medical officer.

d. For wounds involving the extremities, pending medical attention, place a lightly constricting band (tourniquet) 2 to 4 inches closer to the heart than the site of the wound. The band should be tight enough to halt the flow of blood in superficial blood vessels but not tight enough to stop the pulse (arterial flow).

WARNING

RADIO-FREQUENCY RADIATION HAZARD

Radio-frequency radiations from radar antennas and associated equipment could present a potential hazard to battery personnel. The effect of RF radiation is not cumulative, but it could be hazardous. RF radiation heats the body tissues. When the intensity is high, the radiation may produce enough heat to damage the tissues permanently. Damage to the body tissue is not immediately apparent. Precautions should be taken to insure that personnel are not exposed to RF radiations of hazardous intensity levels.

A power level of 10 milliwatts per square centimeter, although not considered potentially hazardous, is stipulated by AR 40-583 as the maximum permissible exposure level for personnel subjected to RF radiation fields. Personnel should not be permitted to enter areas where they may be exposed to levels above 10 milliwatts per square centimeter.

A power density of 10 milliwatts per square centimeter is present along the axis of the transmitted beam at the following distances from Improved NIKE-HERCULES radar antennas. In each instance, the intensity rapidly diminishes as the distance is increased.

ANTENNA	DISTANCE
AJI High Power Acquisition Radar	
Systems 502 - 537 - Non-scanning	240 feet
Systems 502 - 537 - Rotating	33 feet
Systems 538 - 594 and 801 and above - Non-scanning	330 feet
Systems 538 - 594 and 801 and above - Rotating	60 feet
Low Power Acquisition Radar - Non-scanning	127 feet
Missile Tracking Radar - NIKE-AJAX Mode	126 feet
Target Tracking Radar - Wide Pulse Mode	230 feet

Transmitting antennas in the non-scanning mode should not be positioned so as to radiate into areas occupied by passive antennas. The resulting reflections may present a potential hazard to personnel working in the vicinity of the passive antennas.

The intensity of the beam from the target tracking radar in the narrow pulse mode, from the low power acquisition radar when rotating, from the missile tracking radar in the NIKE-HERCULES mode, and from the target ranging radar is inconsequential under operating conditions.

Access to the Mobile HIPAR antenna trailer and the roofs of the equipment vans should be prohibited during periods of radar operation.

This information is based upon average power outputs and may be used as a guide to prevent radio-frequency radiation hazards.

CHAPTER 1 (U)

INTRODUCTION

Section I (U). GENERAL

1 (U). Purpose

This technical manual is published for the information and guidance of operating and organizational maintenance personnel responsible for the operation and maintenance of the radar course directing central (RCDC) of the Improved NIKE-HERCULES Air Defense Guided Missile System, with the exception of voice communication circuits and equipment. This manual provides instructions for operating the high power acquisition radar (HIPAR) and the auxiliary acquisition radar (AAR) from the trailer mounted director station. For operation and organizational maintenance instructions for HIPAR, refer to TM 9-1430-254-12/1 and TM 9-1430-254-12/4 or TM 9-1430-257-12/1; and for AAR, refer to the appropriate operator's manual.

2 (U). Scope

a. Operation and organizational maintenance of the RCDC given in this manual includes functional and physical characteristics: individual functions of controls and indicators used by the operator and maintenance technician; all nontactical operations required during energizing, normal operation, and deenergizing; access procedures; painting; repair parts, tools, and test equipment; and service upon receipt. Maintenance that is the responsibility of the operator and maintenance technician is also given in this manual. Operation of equipment associated with the RCDC is contained in the manuals listed below.

(1) TM 9-1425-250-12/1 gives the operation of the voice communications circuits and equipment.

(2) TM 11-5895-207-10 and TM 11-5895-208-10 give the detailed operation of the selective identification feature/identification friend or foe (SIF/IFF) system.

(3) TM 9-1430-250-10/3 gives the procedures for operation in an electronic countermeasures environment.

(4) TM 9-1430-580-14 gives the operation of the AN/GSA-77 battery terminal equipment (BTE).

(5) Refer to TM 9-1400-250-15/2 for instructions concerning destruction of material to prevent enemy use.

b. This manual is technically correct for all Improved NIKE-HERCULES systems provided the pertinent modification work orders (MWO's) listed in the remainder of this subparagraph have been incorporated.

(1) 9-1400-250-30/24 permits automatic missile acquire circuits to correct for small errors in the launcher position data (suffix serial numbers 001 through 159).

(2) 9-1400-250-30/40 provides better unit adjustments so that dc level requirements can be met with a minimum of tube selection (suffix serial numbers 001 through 125). It also provides "target tracked" indication to fire unit integration facility (FUIF) equipment during radar bomb scoring mission (suffix serial numbers 001 through 204).

(3) 9-1400-250-30/51 adds altitude indication on elevation A-scope and achieves continuity of shield throughout the shielded wire run in the director station group (suffix serial numbers 001 through 288).

(4) 9-1400-250-50/5 provides anti-jam display (AJD) capabilities to Improved NIKE-HERCULES acquisition radar systems (all systems).

(5) 9-1400-250-50/28 provides facilities for connecting radar signal simulator station AN/MPQ-T1 (T1 trainer) and adds functions for annual service practice (ASP) to the Improved NIKE-HERCULES and NIKE-

HERCULES ATBM systems. It also provides facilities and adds functions for system compatability with the electronic counter-countermeasures (ECCM) console on Improved NIKE-HERCULES systems having auxiliary acquisition radar (AAR) (suffix serial numbers 001 through 158, 162, 163, 169, 180, 181, 184, 185, 192, and 196 through 198).

(6) 9-1400-250-50/43 adds a SIMULATE indicator light to indicate when a firing simulator or flight simulator is in use in the launching area (all systems).

(7) 9-1400-250-50/53 incorporates the anti-jam improvement (AJI) capabilities into the high power acquisition radar (HIPAR) system (all HIPAR systems 815 and below).

(8) 9-1400-262-30 adds necessary facilities for maintaining the frequency of the missile tracking radar transmitter at a predetermined value (all systems).

(9) 9-1400-291-50 changes the director-computer group in the Improved NIKE-HERCULES system to be compatible with the HIPAR anti-jam display (AJD) facilities (HIPAR systems 503 through 514 and INH suffix serial numbers 001 through 028).

(10) 9-1430-251-30/8 provides facilities for adding radar bomb scoring equipment to the trailer mounted director station (all systems).

(11) 9-1430-251-30/16 improves tactical signaling and FUIF displays by adding VALIDITY switch and by adding BOTH switch position to control-indicator. Replaces high voltage connectors and eliminates safety hazard and capacitor failure in the azimuth and range indicator (suffix serial numbers 001 through 128).

(12) 9-1430-251-30/26 provides an INH ground guidance system that will be compatible with the incorporation of electronic frequency selection (EFS) in HIPAR by replacing the auxiliary HIPAR control-indicator (suffix serial numbers 001 through 093).

(13) 9-1430-251-30/27 facilitates azimuth alinement procedures, improves HIPAR target transfer time by reducing azimuth error, and eliminates distortion of the HIPAR presentation (suffix serial numbers 001 through 202).

(14) 9-1430-251-30/29 equalizes video signal-to-noise ratio for low power acquisition radar (LOPAR) and HIPAR or AAR; eliminates need for plan position indicator (PPI) and B-scope readjustment each time the video input is switched; and eliminates resistor overload (suffix serial numbers 001 through 139).

(15) 9-1430-251-30/35 facilitates azimuth alinement procedures, improves HIPAR target transfer time by reducing azimuth error, and eliminates distortion of the HIPAR presentation (suffix serial numbers 001 through 236).

(16) 9-1430-251-30/37 relocates the 10 EFS/HIPAR channel selection switches and makes the director-computer group compatible with the HIPAR anti-jam improvements, replaces power output meter in HIPAR auxiliary control-indicator, and adds AAR control panel to systems with AAR capabilities (suffix serial numbers 001 through 316).

(17) 9-1430-251-30/39 provides facilities for connecting the AN/GSA-77 battery terminal equipment BTE in the director station trailer (suffix serial numbers 001 through 316).

(18) 9-1430-252-30/2/4 lowers excessive temperatures in certain areas of the tracking station by providing ventilating equipment (suffix serial numbers 001 through 128).

(19) 9-1430-252-30/2/17 improves tracking capabilities of the target track and target range antenna-receiver-transmitter groups by incorporation of linear-logarithmic receivers (suffix serial numbers 001 through 251).

for connecting the AN/GSA–77 battery terminal equipment (BTE) in the director station trailer (systems suffix serial numbers 001 through 316).

b.1. Refer to DA PAM 310–7 for all MWO's applicable to the equipment.

c. This is one of a series of technical manuals on the operation, emplacement, and maintenance of the Improved NIKE–HERCULES Air Defense Guided Missile System. Refer to DA PAM 310–4 for a listing of publications indexes, administrative publications, forms and records publications, supply publications, and NIKE technical manuals.

d. (Deleted).

e. Differences among models of the Improved NIKE–HERCULES systems which affect this manual are described below.

(20) 9-1430-252-30/2/20 provides better automatic angle tracking by maintaining optimum signal level to angle error detector (suffix serial numbers 001 through 316).

(21) 9-1430-253-50/2 improves moisture drainage in tracking antennas to prevent corrosion (suffix serial numbers 001 through 137).

(22) 9-1430-253-50/3 improves the aerodynamic characteristics of the tracking and range antennas for increased operating effectiveness during high wind conditions (selected systems).

(23) 9-1430-254-30/1/8 prevents the LOPAR transmitter from being triggered by the radiated energy from HIPAR or similar radars and improves LOPAR AFC lock-on (all INH systems with system serial numbers 1001 through 1393).

(24) 9-1430-254-30/2/1 provides additional anti-jamming capabilities to the HIPAR equipment (systems 502 through 514).

(25) 9-1430-254-30/2/7 provides improved facilities for waveguide pressurization (systems 503 through 518).

b.1. Refer to DA PAM 310-7 for all MWO's applicable to the equipment.

c. This is one of a series of technical manuals on the operation, emplacement, and maintenance of the Improved NIKE-HERCULES Air Defense Guided Missile System. Refer to DA PAM 310-2 and DA PAM 310-4 for a listing of publications indexes, administrative publications, forms and records publications, supply publications, and NIKE technical manuals.

d. (Deleted)

e. Differences among models of the Improved NIKE-HERCULES systems which affect this manual are described below.

(1) The left- and right-swinging frame computer amplifier-relay group subassemblies are modified on NIKE-HERCULES systems 1219 and above to relocate controls and test points used with the null-voltage test set. For systems 1218 and below, a test panel located on the right-swinging frame computer amplifier-relay group subassembly is used.

(2) Improved NIKE-HERCULES system radar test sets and spare radar test sets of battalions having NIKE-HERCULES or Improved NIKE-HERCULES systems are modified by adding a HERC-HERC IMPR SYSTEM switch, enabling them to be used with NIKE-HERCULES and Improved NIKE-HERCULES systems.

(3) The personnel heater in the trailer mounted director station and trailer mounted tracking station on systems 1001 through 1086 is replaced on systems 1087 and above with a new personnel heater.

(4) The hydraulic control unit on systems 1001 through 1070 has been replaced with the electromechanical control box on systems 1071 and above.

(5) On systems 1001 through 1021, the acquisition antenna pedestal has an azimuth scale around the top. On systems 1022 and above, the azimuth scale has been removed.

(6) (Deleted)

(7) The siren bracket on systems 1001 through 1015 is located at the upper rear roadside corner of the trailer mounted director station. The siren bracket above is located at the upper front roadside corner of the trailer mounted director station.

(8) On early production systems, the slide in the servo computer assembly upper compartment had no opening to allow access to the zeroing pins. On later production systems, an opening has been provided for access to the zeroing pins (systems 1071 and above).

(9) In systems 1049 and above, fuse F1 in the director station group and fuses F64 and F65 in the radar power supply group are one ampere. F1, F64, and F65 are two amperes in systems 1048 and below.

(10) Systems 1031 and above have resistors and a relay added to the zero check circuits in groups four and ten of the computer. These were added to improve the validity of the readings on the affected amplifiers.

(11) Special purpose kit 1430-073-8880 prevents interference between the TD-2 communication system and the LOPAR (selected systems).

(12) Special purpose kit 1430-740-1500 eliminates television interference in the acquisition radar receiver-transmitter (selected systems).

3 (U). Nomenclature

A nomenclature cross-reference of TM and official nomenclature for items of the RCDC of the Improved NIKE-HERCULES system is provided in TM 9-1430-251-12/3, TM 9-1430-255-12/2, TM 9-1430-256-12/2, TM 9-1430-254-12/6.

4 (U). Abbreviations

All abbreviations used in this manual are listed in Appendix II.

5 (U). Maintenance Allocation for Operators and Organizational Maintenance Technicians

a. In general, the prescribed maintenance responsibilities of the operators and organizational maintenance personnel apply as reflected in the allocation of tools and repair parts listed in the technical manuals described in paragraph 172*b*. Normally, operator maintenance may be performed only under supervision of a trained organizational maintenance technician. The operator maintenance responsibilities are described in chapter 10. The organizational maintenance personnel responsibilities are described in chapter 11.

b. In all cases where the nature of repair, modification, or adjustment is beyond the scope or facilities of the using organization, inform the supporting maintenance unit.

Section II (U). FORMS, RECORDS, AND REPORTS

6 (U). Forms, Records, and Reports

Refer to TM 38-750 for instructions on the use and completion of all forms required for operating and maintaining the equipment.

7 (U). Report of Equipment Publication Improvements

Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to: Commanding General, U. S. Army Missile Command, ATTN: AMSMI-SMPT (NMP), Redstone Arsenal, Alabama 35809.

CHAPTER 2 (C)

FUNCTIONAL DESCRIPTION OF THE RADAR COURSE DIRECTING CENTRAL

Section I (C). GENERAL

8 (U). Purpose

The radar course directing central (RCDC) functions as the command and control center of the Improved NIKE-HERCULES Air Defense Guided Missile System. The RCDC detects, identifies, tracks airborne targets, and guides NIKE-AJAX or NIKE-HERCULES missiles to intercept and destroy hostile targets. The RCDC may also be conditioned to operate against surface targets.

9 (C). Capabilities

The RCDC can detect targets up to a range of 250,000 yards when using the LOPAR system and up to a range of 350,000 yards when using the HIPAR/AAR system. The RCDC can track targets up to a range of 200,000 yards. With the addition of anti-jam display (AJD) capabilities to the LOPAR and HIPAR/AAR systems, the RCDC can detect and track targets even when the LOPAR and HIPAR systems are exposed to an extremely high level of transmission jamming. The RCDC provides guidance for NIKE-HERCULES missiles during two types of missions—surface-to-air and surface-to-surface—as described in *a* and *b* below. The RCDC provides guidance for NIKE-AJAX missiles during surface-to-air missions only. In addition, the RCDC may be used in radar bomb scoring missions as described in *c* below. Operating conditions for the RCDC are described in *d* below.

a. Surface-to-Air Mission. The RCDC can guide a NIKE-HERCULES missile to intercept and destroy entire formations of high performance aircraft and air supported missiles. Intercept can be made at ranges in excess of 150,000 yards and at altitudes up to 100,000 feet. The NIKE-HERCULES missile can attain a maximum velocity of 2,250 knots and has a maneuverability advantage over all known tactical manned aircraft. However, an intercept cannot be made within the dead zone (fig. 1) surrounding the missile launcher. This dead zone has a ground radius of approximately 10,000 yards and an altitude of approximately 22,000 feet. The dead zone is determined by the launch angle and the minimum diving radius of the missile. The RCDC can guide a NIKE-AJAX missile to intercept and destroy single aircraft at ranges up to 50,000 yards. Figure 1 shows the Improved NIKE-HERCULES System capabilities against manned aircraft and air supported missiles.

b. Surface-to-Surface Mission. The RCDC can guide a NIKE-HERCULES missile, armed with a nuclear warhead, to a surface target at a maximum range of 100 nautical miles (fig. 2).

c. Radar Bomb Scoring Mission. The RCDC can be used in conjunction with Air Force equipment on radar bomb scoring missions. These missions are employed to rate the proficiency of Air Force bomber crews engaged in simulated bombing raids on assigned targets.

d. Operating Conditions. The RCDC is capable of operating 23 hours a day without impairment of performance and at least 5,000 hours without major overhaul. The RCDC operates efficiently over an ambient temperature range of −40° to +125° F at relative humidities up to 100 percent and at altitudes up to 10,000 feet above sea level. Rain, dust, snow, sand, salt air, steady surface winds up to 60 miles per hour, and surface gusts up to 75 miles per hour do not interfere with normal operation.

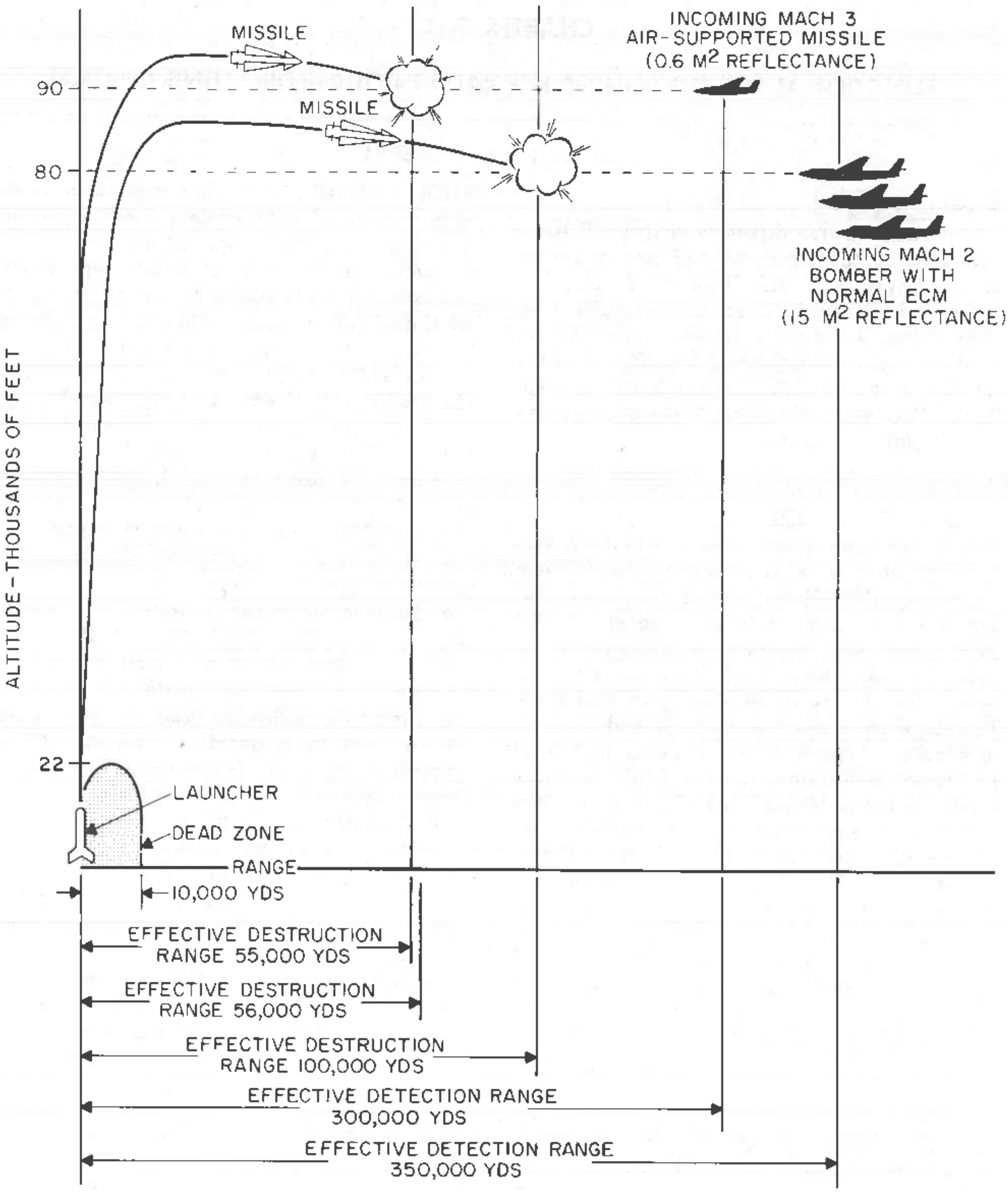

Figure 1 (C). Improved NIKE-HERCULES air defense guided missile system—surface-to-air mission capabilities (U).

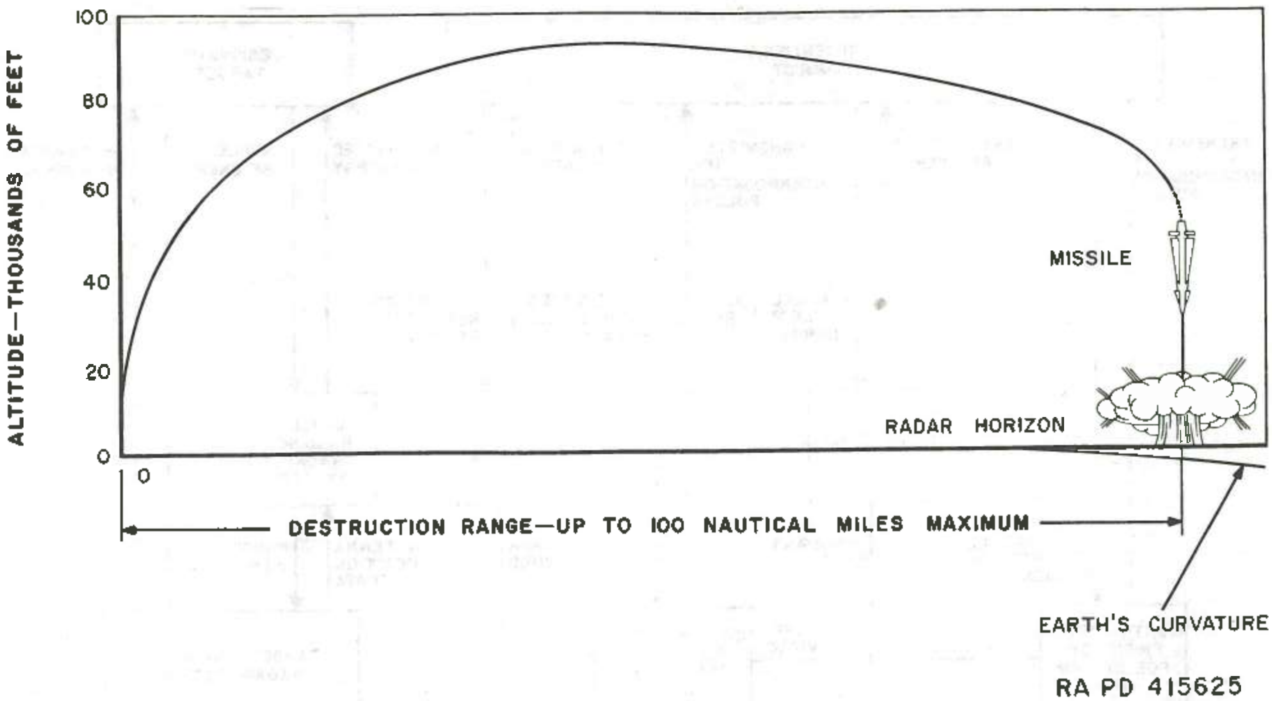

Figure 2 (C). Surface-to-surface mission capabilities (U).

Section II (U). OVERALL FUNCTIONAL DESCRIPTION OF THE RADAR COURSE DIRECT CENTRAL

10 (U). General

The radar course directing central (RCDC) has two operational missions: surface-to-air and surface-to-surface. The RCDC can also be used for radar bomb scoring of simulated bombing runs. The major operational systems of the RCDC are the two acquisition radar systems (LOPAR and HIPAR or LOPAR and AAR), the target tracking radar system, the target ranging radar system, the missile tracking radar system, the computer system, and the tactical control system.

11 (U). Block Diagram Analysis for Surface-to-Air Missions

a. Either acquisition radar system, HIPAR/AAR or LOPAR (fig. 3) can be selected through the radar-select circuit. The selected acquisition radar system transmits pulsed high-power RF energy through a highly directive antenna. An unidentified object in the path of this radar beam causes a portion of the RF energy to be reflected to the acquisition radar system. The acquisition radar system converts the reflected RF energy into acquisition video. If the unidentified object is emitting noise or CW ECM signals, the AJD facilities in the acquisition radar system process the video to remove the jamming effects of the ECM and to provide an azimuth indication of the jammer. Each acquisition radar system has an identification friend or foe (IFF) system. IFF interrogation pulses are transmitted by the IFF system. IFF response pulses from IFF transponders of friendly aircraft are received by the IFF system and converted into IFF video. The acquisition video from the acquisition radar system and the IFF video from the IFF system are applied as tactical control data to the tactical control system for evaluation. Tactical control data received from the Army Air Defense Command Post (AADCP) through the fire unit integration facility (FUIF) or battery terminal equipment (BTE) is also applied to the tactical control system for evaluation. From this evaluation, an aircraft's position and identity are determined. If the air-

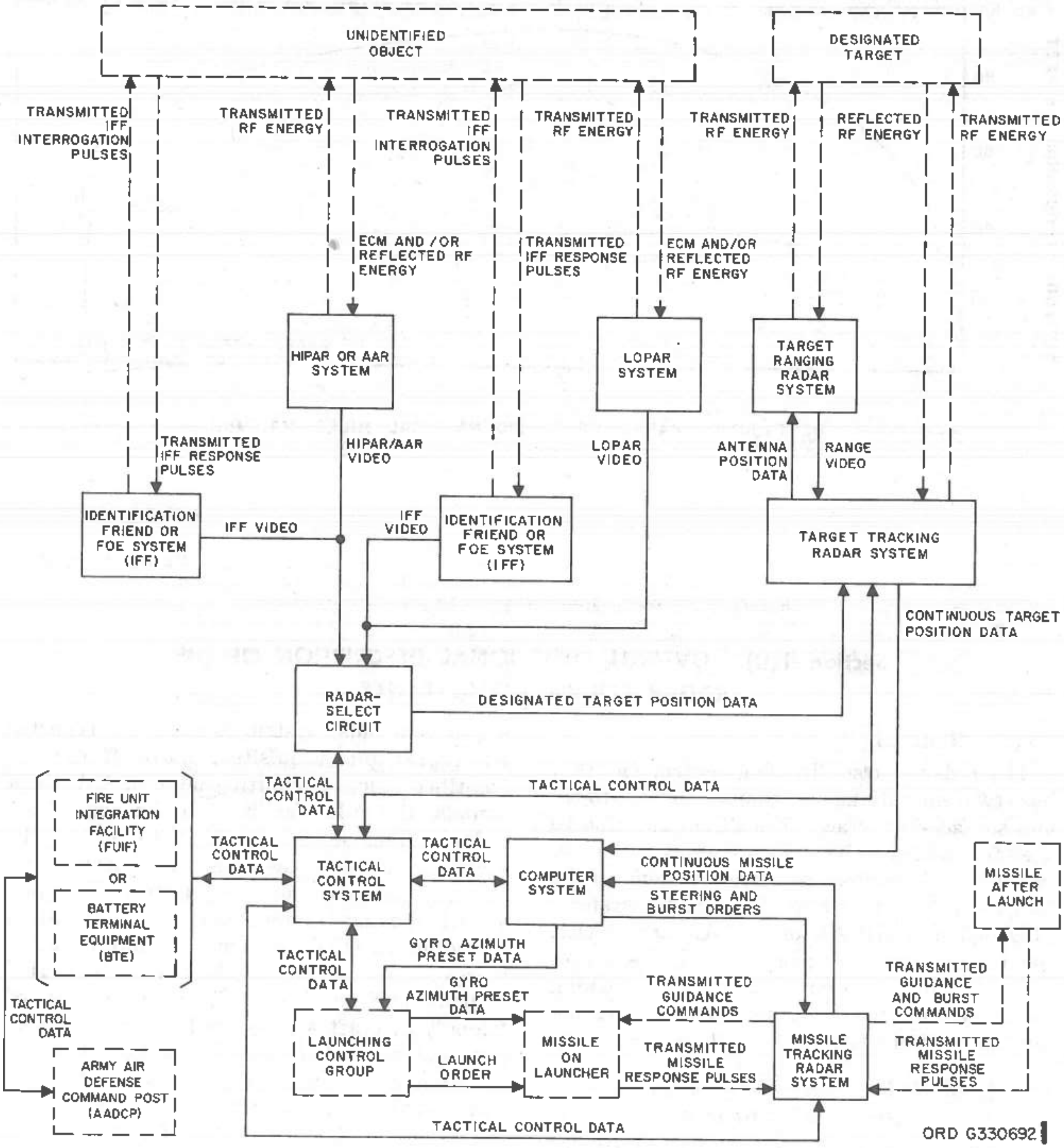

Figure 3 (U). RCDC—block diagram (U).

craft is hostile, azimuth and range positioning data from the acquisition radar system is applied to the TTR system as designated target position data.

b. The designated target position data from the acquisition radar system enables the antennas of the TTR and TRR systems to slew to the designated target in azimuth and range. The target must be acquired manually in elevation. The TRR system is slaved in azimuth and elevation to the TTR system. The reflected RF energy from the designated target enables the

TTR and TRR systems to track the target and provide continuous target position data to the computer system.

c. The MTR system transmits coded pulses of RF energy (guidance and burst commands). The coded pulses are received by the missile before and after launch. Each time the missile receives a guidance command it transmits an RF missile response pulse. The missile response pulses enable the MTR system to track the missile and to provide continuous missile position data to the computer system.

d. The computer system, continuously computes a predicted intercept point from the continuous position data supplied by the TTR system. The computer system then sends tactical control data to the tactical control system. Gyro azimuth preset data is sent through the launching control group to the missile to orient the roll amount gyro in the missile prior to launch. After launch, when the rocket motor cluster has separated from the missile, the roll amount gyro provides a stable reference that enables the missile to roll to a predetermined attitude (belly down) with respect to the predicted intercept point. The missile is then guided in the direction of the predicted intercept point. Steering and burst orders are produced by the computer system from continuous target and missile position data and are applied to the MTR system. The MTR system converts the steering and burst orders into RF guidance and burst commands that are transmitted to the missile. The burst command is sent at a predetermined time before intercept to detonate the missile warhead within the lethal radius of the target.

12 (U). Block Diagram Analysis for Surface-to-Surface Missions

In a surface-to-surface mission, the acquisition radar (fig. 3) and the TRR systems are not required because the target position is known. The range, azimuth, and elevation coordinates of the target are calculated and manually set into the TTR system. Therefore, the TTR system supplies locked coordinates target position data to the computer system instead of the continuous target position data supplied in a normal surface-to-air mission. The function of the computer system is similar to that described in paragraph 11 for a normal surface-to-air mission, except that missile trajectory data is manually set into the computer system causing the missile to be guided toward a point in space above the desired point of impact. Before the missile reaches this reference point in space, the computer system issues a dive order which causes the missile to approach the ground target vertically. As the missile approaches the ground, the computer system sends a burst order to the missile. However, due to special preparation of the missile for a surface-to-surface mission, the burst order does not cause the missile warhead to detonate. Instead, the burst order disables the missile fail-safe mechanism and the missile receiver. The burst order also arms a preset barometric fuze in the missile warhead and rolls the missile 180 degrees to compensate for flight biases inherent in the missile. The missile then follows a vertical trajectory until the barometric fuze causes the nuclear warhead to detonate at a predetermined altitude above the target.

13 (U). Block Diagram Analysis for Radar Bomb Scoring Missions

The radar bomb scoring (RBS) system (fig. 4) is used to rate the proficiency of Air Force bomber crews engaged in simulated bombing missions. It consists of elements of the RCDC, AADCP, the RBS scale factor box, and the RBS control unit. Functionally, the system can be divided into four primary subsystems: target tracking and recording, pen-down, scale factor control, and timing mark. The target tracking and recording system consists of the HIPAR/AAR system, LOPAR system, radar-select circuit, TTR system, a portion of the computer system, and the horizontal plotting board. The pen-down system consists of the tone signal from the bomber, AADCP communications, director station communications unit, RBS control unit, a portion of the computer system, and a portion of the horizontal plotting board. The scale factor control system consists of the RBS control unit, RBS scale factor box, and a portion of the computer system. The timing mark system consists of the RBS control unit and a portion of the computer system. These systems are described in *a* through *d* below.

a. Target Tracking and Recording System. The target tracking and recording system pro-

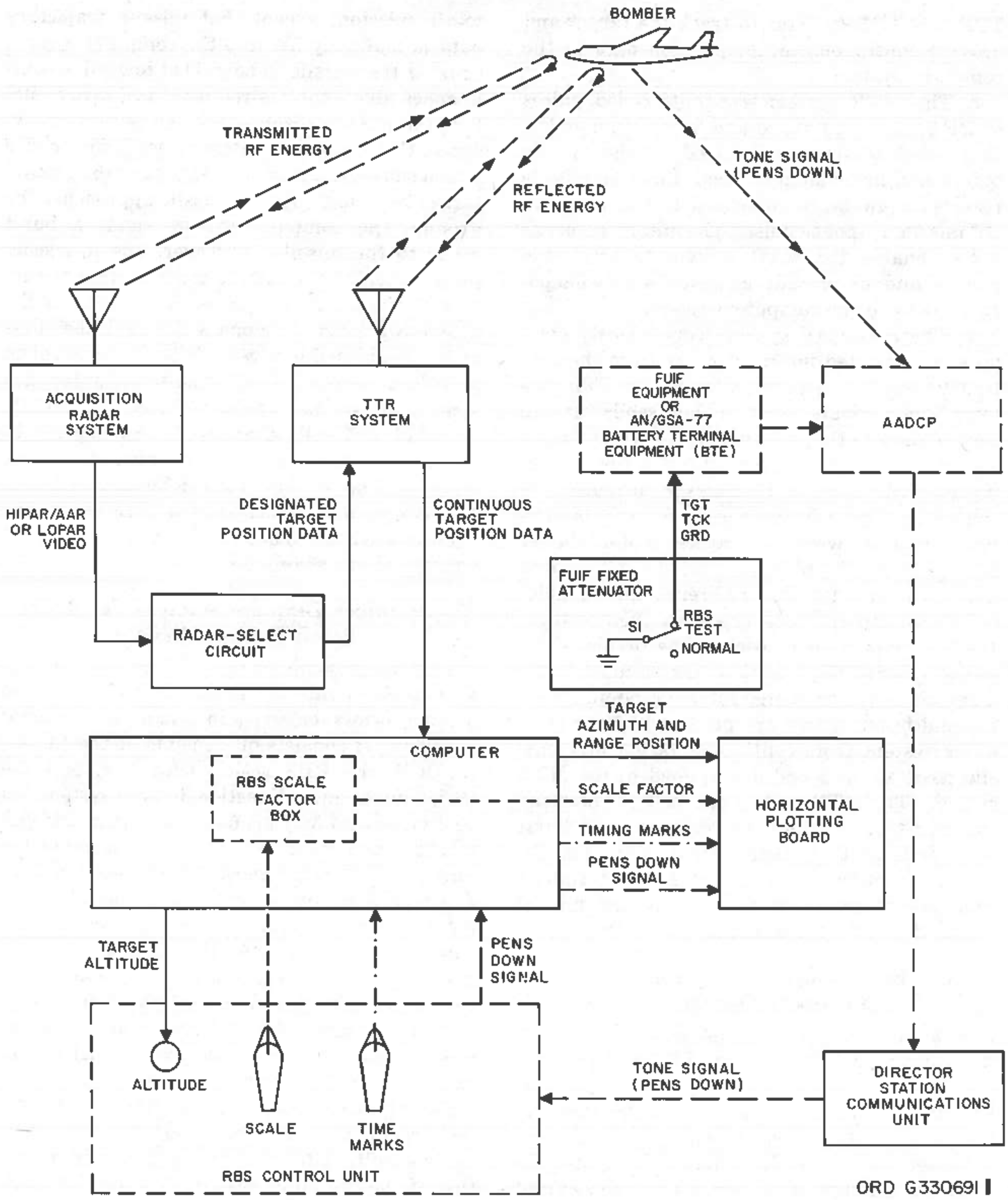

Figure 4 (U). RBS system—block diagram (U).

TTR and TRR systems to track the target and provide continuous target position data to the computer system.

c. The MTR system transmits coded pulses of RF energy (guidance and burst commands). The coded pulses are received by the missile before and after launch. Each time the missile receives a guidance command it transmits an RF missile response pulse. The missile response pulses enable the MTR system to track the missile and to provide continuous missile position data to the computer system.

d. The computer system, continuously computes a predicted intercept point from the continuous position data supplied by the TTR system. The computer system then sends tactical control data to the tactical control system. Gyro azimuth preset data is sent through the launching control group to the missile to orient the roll amount gyro in the missile prior to launch. After launch, when the rocket motor cluster has separated from the missile, the roll amount gyro provides a stable reference that enables the missile to roll to a predetermined attitude (belly down) with respect to the predicted intercept point. The missile is then guided in the direction of the predicted intercept point. Steering and burst orders are produced by the computer system from continuous target and missile position data and are applied to the MTR system. The MTR system converts the steering and burst orders into RF guidance and burst commands that are transmitted to the missile. The burst command is sent at a predetermined time before intercept to detonate the missile warhead within the lethal radius of the target.

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In a surface-to-surface mission, the acquisition radar (fig. 3) and the TRR systems are not required because the target position is known. The range, azimuth, and elevation coordinates of the target are calculated and manually set into the TTR system. Therefore, the TTR system supplies locked coordinates target position data to the computer system instead of the continuous target position data supplied in a normal surface-to-air mission. The function of the computer system is similar to that described in paragraph 11 for a normal surface-to-air mission, except that missile trajectory data is manually set into the computer system causing the missile to be guided toward a point in space above the desired point of impact. Before the missile reaches this reference point in space, the computer system issues a dive order which causes the missile to approach the ground target vertically. As the missile approaches the ground, the computer system sends a burst order to the missile. However, due to special preparation of the missile for a surface-to-surface mission, the burst order does not cause the missile warhead to detonate. Instead, the burst order disables the missile fail-safe mechanism and the missile receiver. The burst order also arms a preset barometric fuze in the missile warhead and rolls the missile 180 degrees to compensate for flight biases inherent in the missile. The missile then follows a vertical trajectory until the barometric fuze causes the nuclear warhead to detonate at a predetermined altitude above the target.

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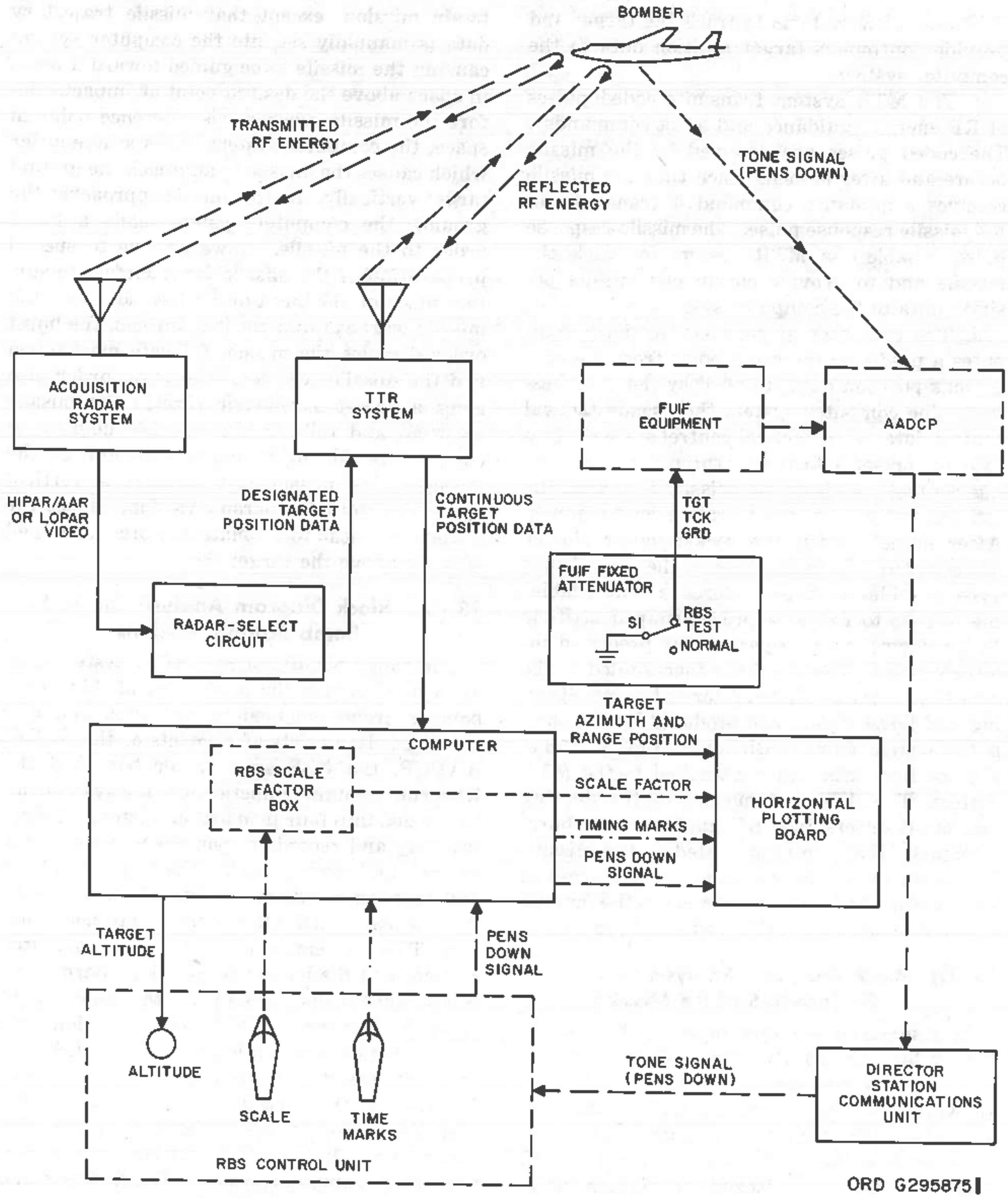

Figure 4 (U). RBS system—block diagram (U).

TTR and TRR systems to track the target and provide continuous target position data to the computer system.

c. The MTR system transmits coded pulses of RF energy (guidance and burst commands). The coded pulses are received by the missile before and after launch. Each time the missile receives a guidance command it transmits an RF missile response pulse. The missile response pulses enable the MTR system to track the missile and to provide continuous missile position data to the computer system.

d. The computer system, continuously computes a predicted intercept point from the continuous position data supplied by the TTR system. The computer system then sends tactical control data to the tactical control system. Gyro azimuth preset data is sent through the launching control group to the missile to orient the roll amount gyro in the missile prior to launch. After launch, when the rocket motor cluster has separated from the missile, the roll amount gyro provides a stable reference that enables the missile to roll to a predetermined attitude (belly down) with respect to the predicted intercept point. The missile is then guided in the direction of the predicted intercept point. Steering and burst orders are produced by the computer system from continuous target and missile position data and are applied to the MTR system. The MTR system converts the steering and burst orders into RF guidance and burst commands that are transmitted to the missile. The burst command is sent at a predetermined time before intercept to detonate the missile warhead within the lethal radius of the target.

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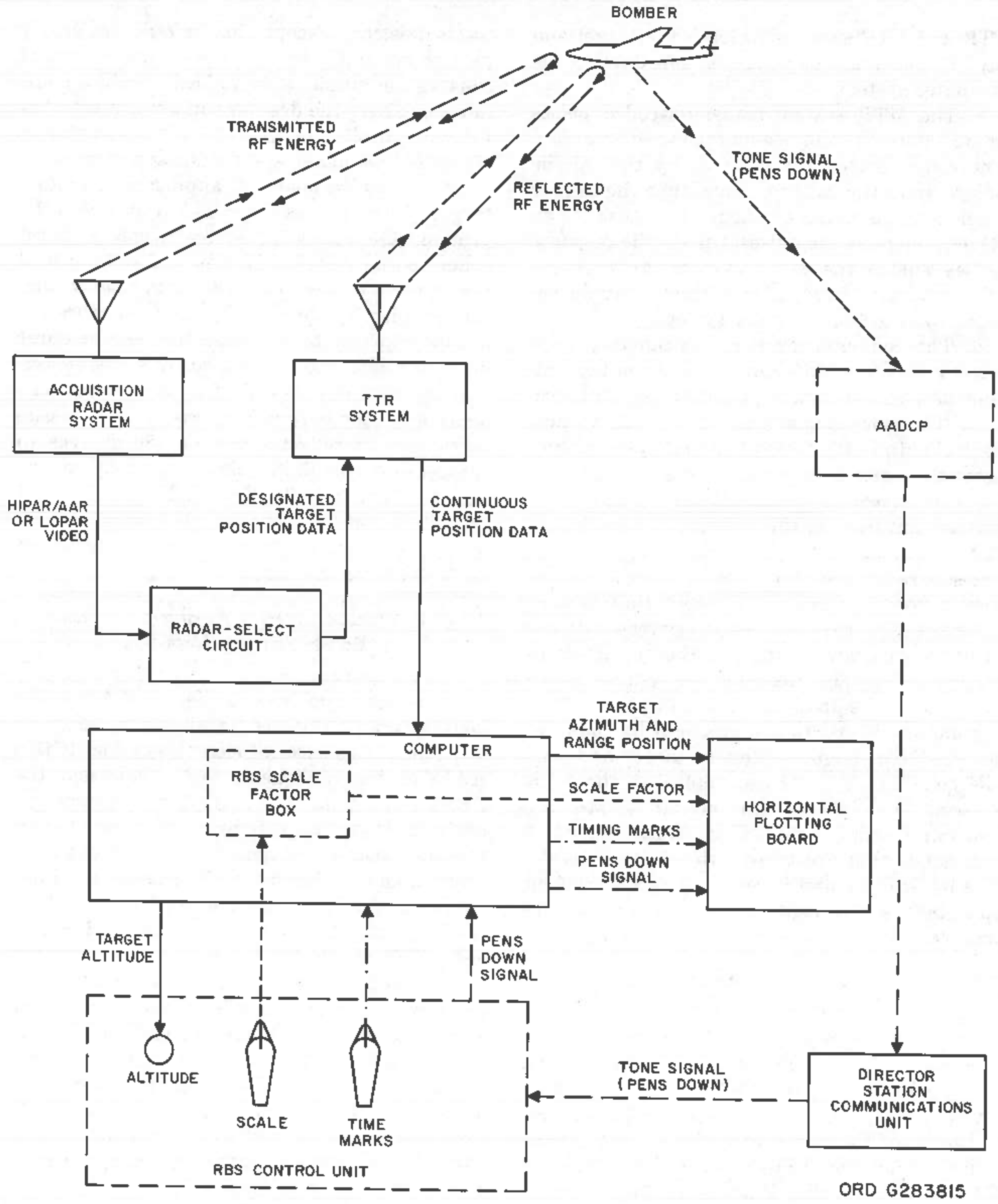


Figure 4 (U). RBS system—block diagram (U).

vides accurate position data on the bomber during the mission and records this data on the horizontal plotting board. As the bomber approaches its assigned target, it is acquired and tracked in the normal surface-to-air manner. The computer system processes the target position data and sends continuous target azimuth and range information to the right side of the horizontal plotting board, and continuous target altitude information to the RBS control unit. The right plotting pen on the horizontal plotting board follows the azimuth and range of the bomber during the entire mission, while indicators on the RBS control unit display the altitude of the bomber.

b. Pen-Down System. The pen-down system controls the position of the right plotting pen above the plotting paper. When the pen-down signal is present at the horizontal plotting board, the pen is placed in recording position; and, when the pen-down signal is absent, the pen is placed in nonrecording position. As the bomber begins its bombing run on the assigned target, a continuous tone signal (pen-down signal) is transmitted from the bomber to the AADCP by UHF radio. The AADCP then transmits the received tone signal to the director station communications unit in the RCDC. The communications unit sends the tone signal to the RBS control unit where tone sensitive circuits generate the pen-down signal. The pen-down signal is then sent to the computer system and from the computer system to the right side of the horizontal plotting board, causing the right plotting pen to lower to the recording position.

c. Scale Factor Control System. The scale factor control system provides a means for electrically expanding the horizontal plotting board scale so that greater bomb scoring accuracy can be obtained when the plotting board records are analyzed. Scale expansion is initiated by a switch on the RBS control unit. When the switch is in the expand position, a scale change signal is sent to the RBS scale factor box located in the computer system. The RBS scale factor box causes the computer system to modify target azimuth and range position information sent to the horizontal plotting board so that the plotting pen, recording bomber position information, moves at a rate equivalent to the scale change.

d. Timing Mark System. A special timing mark system is used in radar bomb scoring to increase the accuracy in determining bomber speed from plotting board recordings. The RBS control unit contains a 6-second timing mark generator and a timing mark switch which is used to select either vertical or horizontal recording of the timing marks. Timing marks are sent from the RBS control unit to the computer system and from the computer system to the right plotting pen which records the timing marks vertically or horizontally on the horizontal plotting board trace.

e. Test Switch. During RBS missions, NORMAL—RBS TEST switch S1 on the FUIF fixed attenuator is set to the RBS TEST position to provide a target tracked indication to the AADCP.

***Caution:* Be sure that NORMAL—RBS TEST switch S1 is returned to the NORMAL position upon completion of an RBS mission.**

13.1 (U). Mission Simulator Using T1 Trainer

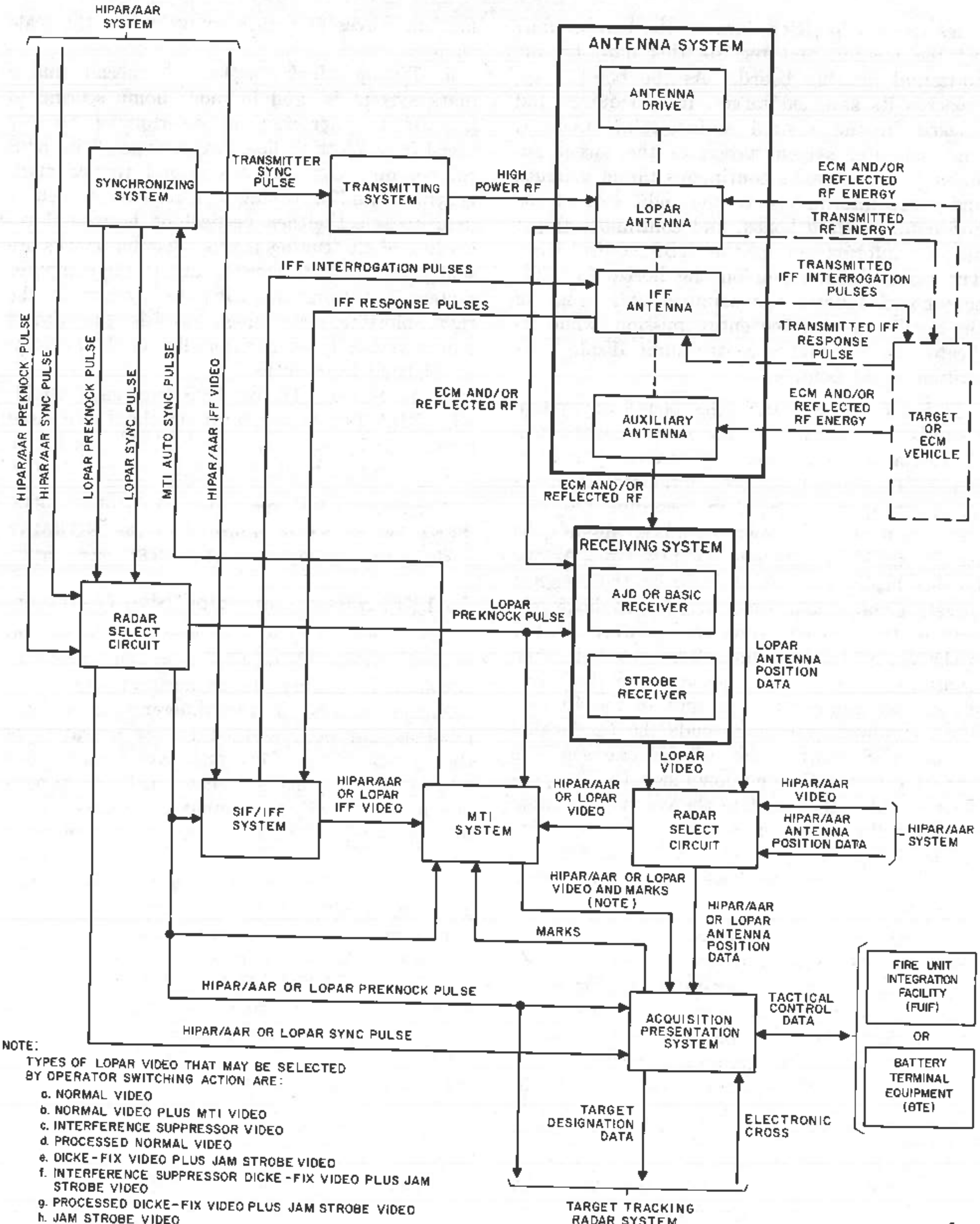
When the T1 trainer is connected to an Improved NIKE-HERCULES system, problems encountered during the acquisition, track and intercept phases of the different air defense missions can be presented to the operators of the system. The T1 trainer can simulate low altitude effects, ECM, chaff, airborne targets and missiles, IFF, and active and passive interference signals. The T1 trainer has the following capabilities:

a. Airborne Targets. One to six airborne targets can be simulated. The course, speed, and size of each target is independently variable.

b. NIKE Missile. The trajectory of a NIKE-AJAX or NIKE-HERCULES missile can be simulated from tracking data supplied by the Improved NIKE-HERCULES system. A live NIKE-AJAX or NIKE-HERCULES missile can also be fired at a simulated target.

c. IFF Signals. IFF signals can be simulated to appear from any one of the six simulated targets.

d. Interference Signals. Interference due to enemy countermeasures (either electronic jamming or chaff) and passive interference due to such factors as terrain can also be simulated.



NOTE:
TYPES OF LOPAR VIDEO THAT MAY BE SELECTED BY OPERATOR SWITCHING ACTION ARE:

a. NORMAL VIDEO
b. NORMAL VIDEO PLUS MTI VIDEO
c. INTERFERENCE SUPPRESSOR VIDEO
d. PROCESSED NORMAL VIDEO
e. DICKE-FIX VIDEO PLUS JAM STROBE VIDEO
f. INTERFERENCE SUPPRESSOR DICKE-FIX VIDEO PLUS JAM STROBE VIDEO
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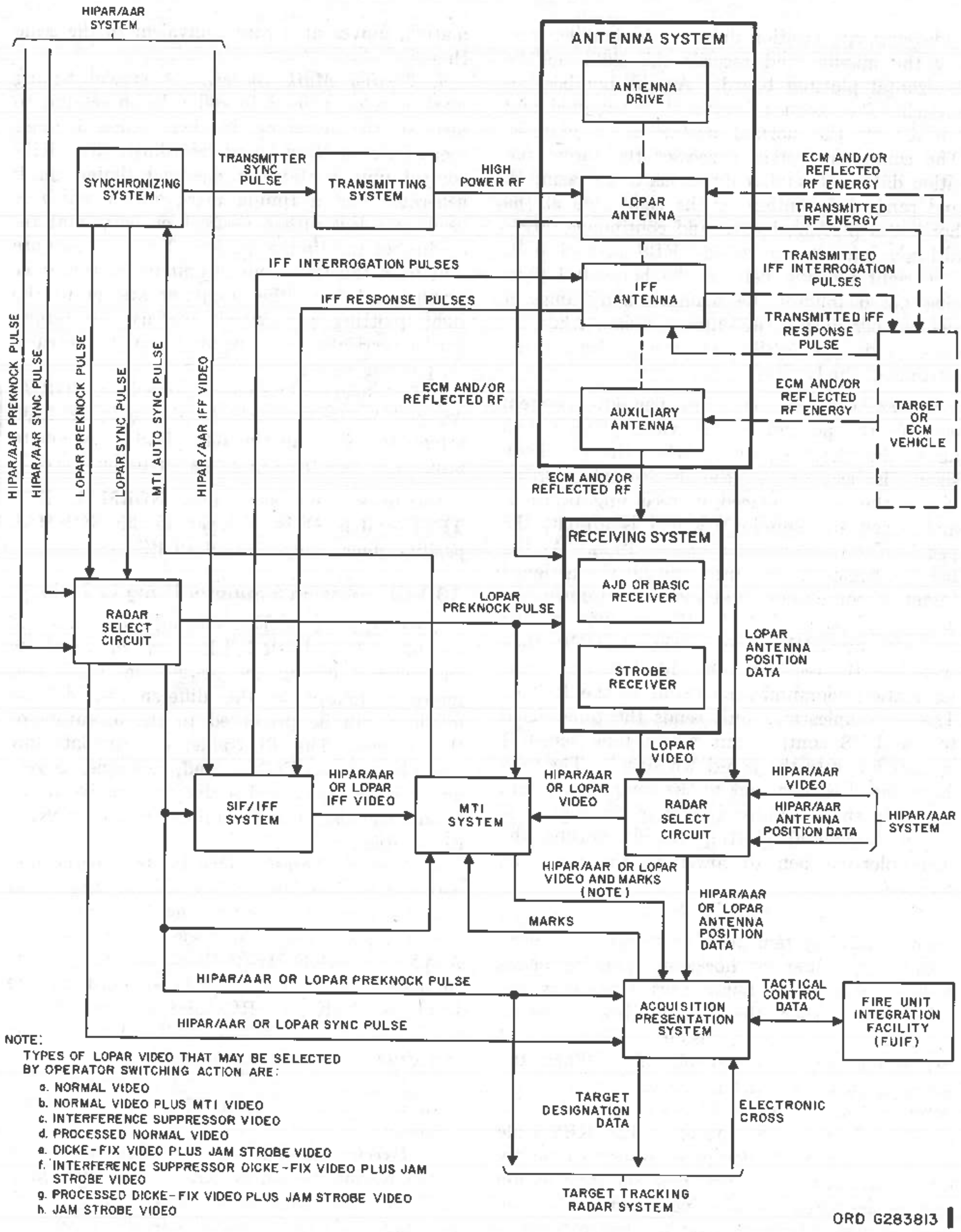

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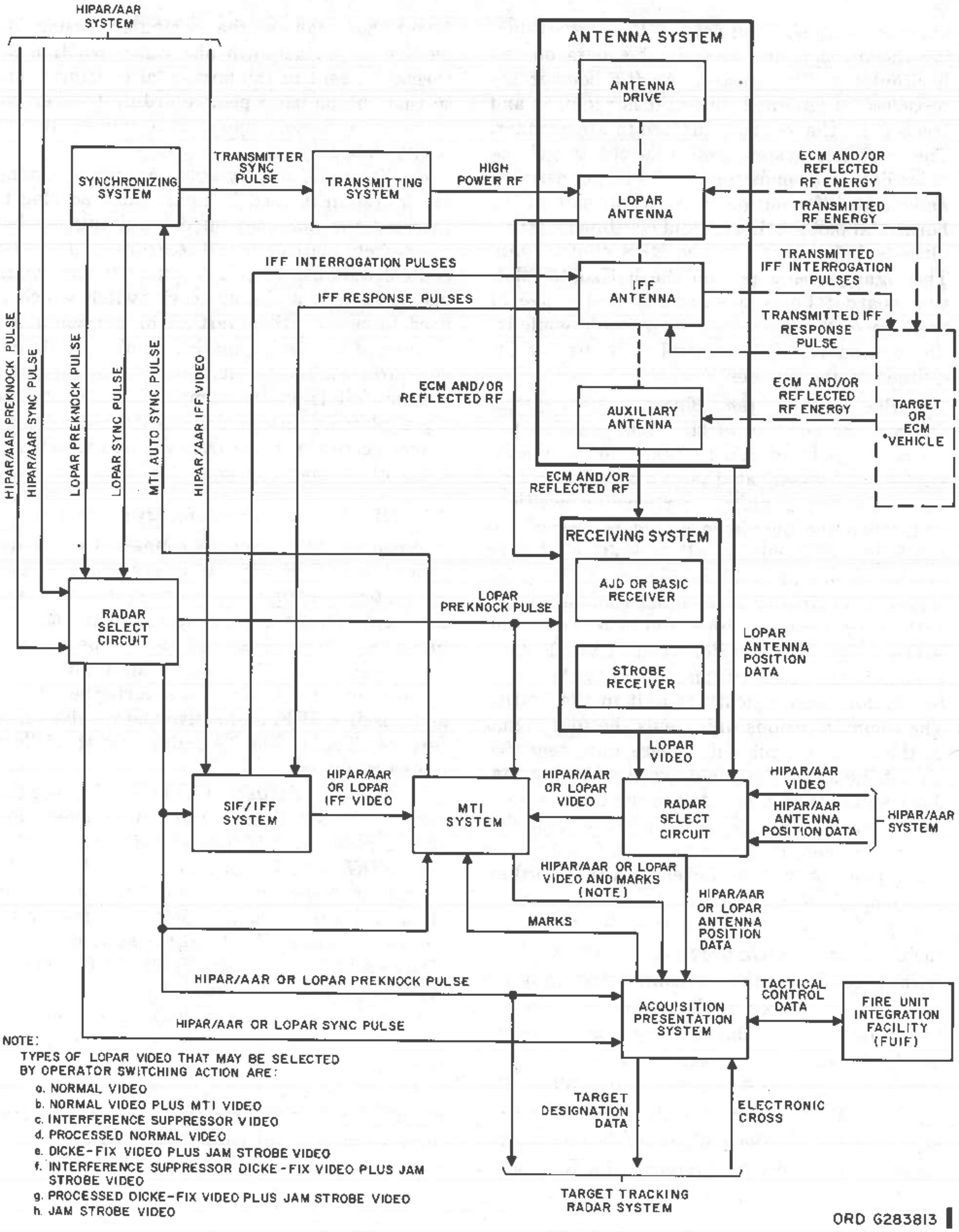

Figure 5 (U). LOPAR system—block diagram (U).

Section III (C). FUNCTIONAL DESCRIPTION OF THE LOPAR SYSTEM

14 (C). General

The LOPAR system, in conjunction with the selective identification feature/identification friend or foe (SIF/IFF) system, detects and interrogates targets within a range of 250,000 yards. The LOPAR system accomplishes detection and interrogation of targets by transmitting RF energy into the area under surveillance and by receiving reflected RF energy. When a target enters this area, RF energy striking the target is reflected back to the LOPAR system where it is amplified and displayed on a PPI in the acquisition presentation system. Azimuth and range data of a designated hostile target is electrically transferred to the TTR and TRR systems. With the AJD capability, the LOPAR system can operate effectively while being subjected to a high level of ECM activity.

15 (C). Block Diagram Analysis

The LOPAR system (fig. 5) consists of synchronizing, transmitting, antenna, receiving, MTI, and SIF/IFF systems. The acquisition presentation system functions as the presentation system for both LOPAR and HIPAR/AAR systems.

a. Synchronizing, Transmitting, and Antenna Systems.

(1) The synchronizing, transmitting, and antenna systems operate together to

originate and transmit pulses of RF energy into space. The synchronizing system initiates LOPAR preknock, LOPAR sync, and transmitter sync pulses which electrically synchronize the operation of the transmitting, receiving, MTI, SIF/IFF, acquisition presentation, TTR, and TRR systems. The transmitter sync pulse is applied to the transmitting system. The LOPAR sync pulse is applied through a radar-select circuit to the acquisition presentation system. The LOPAR preknock pulse is applied to the receiving and MTI systems and through the radar-select circuit to the SIF/IFF, MTI, acquisition presentation, TTR, and TRR systems.

(2) Within the transmitting system, the transmitter sync pulse is shaped, amplified, and used to produce the high power RF energy applied to the system. Within the antenna system, the high power RF energy is directed to the LOPAR antenna. The LOPAR antenna focuses the high power RF energy into a narrow azimuth beam and directs this RF energy through the area under surveillance. The antenna drive completely rotates the LOPAR antenna in azimuth, thus directing the transmitted RF energy throughout 360 degrees. The reflected RF energy and any ECM present from a target or object in the area under surveillance are received by the LOPAR antenna system and applied to the receiving system. Whenever the LOPAR is operating in an ECM environment, the antenna system receives a jamming signal at the azimuth of the ECM vehicle. This information is presented as a strobe line on the PPI.

b. Receiving and MTI Systems.

(1) The LOPAR system provides selection of any of three receivers. These receivers are jam strobe, AJD, and basic. The receiving system amplifies and converts the reflected RF energy from the antenna system into LOPAR video that is applied to the radar-select circuit. (If ECM RF and/or reflected RF energy is received, the AJD receiver circuits combine these signals and apply the result to the radar-select circuit as LOPAR video.) The jam strobe receiver provides video indication at the azimuth of the ECM vehicle. The basic receiver can be used during emergency conditions. HIPAR/AAR video from the HIPAR/AAR system is also applied to the radar-select circuit. Either LOPAR or HIPAR/AAR video is applied through the MTI system to the acquisition presentation system, as determined by the radar-select circuit. Either LOPAR or HIPAR/AAR IFF video from the SIF/IFF system is also applied through the MTI system.

(2) The MTI system provides both MTI and bypass video. The MTI video is that part of the LOPAR video produced by moving objects within a selected area. The LOPAR video produced by stationary objects within the selected area is cancelled by the MTI system. The bypass video is that part of the LOPAR video produced by both moving and stationary objects beyond the selected area. The selected area is 360 degrees in azimuth or a preselected sector and can be adjusted in range from 0 to 250,000 yards. The MTI bypass and LOPAR IFF video are combined in the MTI system with marks from the acquisition presentation system and are applied to the acquisition presentation system as LOPAR video and marks. The HIPAR/AAR video and HIPAR/AAR IFF video are combined in the MTI system with marks from the acquisition presentation system and are applied to the acquisition presentation system as HIPAR/AAR video and marks.

c. SIF/IFF Systems.

(1) The LOPAR system uses the MARK X

SIF/IFF system for target interrogation. The MARK X SIF/IFF system consists of interrogator set AN/TPX-27 (receiver-transmitter RT-211A/TPX, coder-control KY-97B/TPX, and IFF antenna AT-352/UPA-22), decoder group AN/TPA-3 (video-decoder MX-1995/TPA-3 and remote switching control C-1903/TPA-3), and recognition signal simulator SM-140/TPX.

(2) Operation of the SIF/IFF system is initiated by a LOPAR preknock pulse (fig. 6) from the LOPAR synchronizing system that is applied to the coder control. The operating code of the coder control is determined by a coder remote control signal from the IFF auxiliary control-indicator. The coder control then applies coder trigger pulses to the receiver-transmitter. The receiver-transmitter converts the coded trigger pulses into RF IFF interrogation pulses that are transmitted through the IFF antenna. Since the IFF antenna is attached to the LOPAR antenna, the SIF/IFF system can interrogate any target detected by the LOPAR system. If the interrogated target is equipped with an IFF transponder operating at the correct frequency and code, the IFF transponder transmits coded RF IFF response pulses.

(3) The receiver-transmitter converts the RF IFF response pulses into a coded pulse train that is applied to the video decoder. The coded switching signals from the remote switching control and the mode control signals from the SIF/IFF control circuits permit the video decoder to pass only a properly coded pulse train as IFF video. The IFF video is applied through the LOPAR MTI system to the acquisition presentation system for display on the PPI. The recognition signal simulator provides test signals for checking the operation of the SIF/IFF system without the use of an airborne IFF transponder.

d. Acquisition Presentation System.

(1) The acquisition presentation system displays video, IFF response pulses, and FUIF tactical control data to aid in the detection, identification, and acquisition of targets. The displayed video can be LOPAR or HIPAR/AAR, as determined by the radar-select circuit. The acquisition presentation system displays the received video on a PPI and a precision indicator.

(2) The PPI displays target position data (azimuth and range) radially in synchronism with the rotation of the acquisition antenna. The PPI also displays IFF and FUIF data. The acquisition range circle and the acquisition (flashing) azimuth line of the PPI are positioned by manual controls to intersect over the designated target video. In this manner the target position data is made available for transfer to the target tracking and target ranging radar systems. The target tracking radar system generates the electronic cross which may be selected for display on the PPI. The electronic cross designates the azimuth and range of the target tracking and target ranging radar systems. A jam strobe can be presented on the PPI if the LOPAR system is operating in an ECM environment. This jam strobe is presented at the azimuth of the ECM vehicle.

(3) The precision indicator presents an expanded portion of the PPI display covering 533 mils in azimuth (width) and 25,000 yards in range (height), centered about the intersection of the acquisition range circle and the acquisition (flashing) azimuth line. The expanded portion permits more accurate determination of the azimuth and range of the designated target.

(4) When target position data is transferred to the TTR and TRR systems, the electronic cross representing the

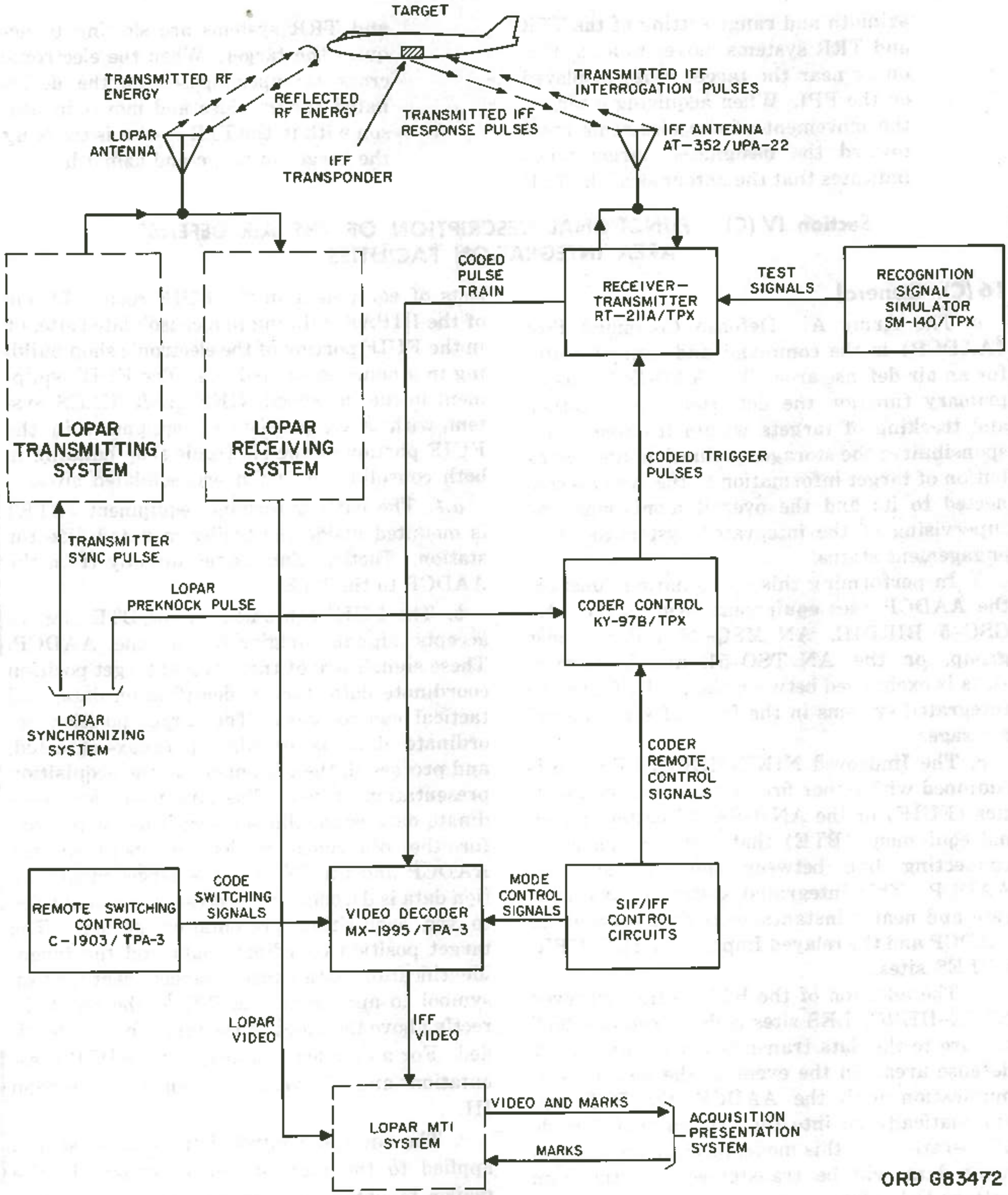

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Figure 6 (U). SIF/IFF system—block diagram (U).

azimuth and range setting of the TTR and TRR systems moves to a position on or near the target video displayed on the PPI. When acquiring a target, the movement of the electronic cross toward the designated target video indicates that the antennas of the TTR and TRR systems are slewing to acquire the target. When the electronic cross is superimposed on the designated target video and moves in unison with it, the TTR system is tracking the target in range and azimuth.

Section IV (C). FUNCTIONAL DESCRIPTION OF THE AIR DEFENSE AREA INTEGRATION FACILITIES

16 (C). General

a. The Army Air Defense Command Post (AADCP) is the command and control center for an air defense area. The AADCP has as its primary function the detection, identification, and tracking of targets within its area of responsibility; the storage, evaluation, and distribution of target information to the systems connected to it; and the overall monitoring and supervising of the integrated system-to-target engagement status.

b. In performing this coordinating function, the AADCP uses equipment such as the AN/GSG-5 BIRDIE, AN/MSQ-38 coder-decoder group, or the AN/TSQ-51 missile mentor. Data is exchanged between the AADCP and the integrated systems in the form of serial digital messages.

c. The Improved NIKE-HERCULES site is equipped with either fire unit integration facilities (FUIF) or the AN/GSA-77 battery terminal equipment (BTE) that serves as an interconnecting line between the site and the AADCP. This integrated system relays accurate and nearly instantaneous data between an AADCP and the relayed Improved NIKE-HERCULES sites.

d. The addition of the BTE to the Improved NIKE-HERCULES sites adds a "round robin" feature to the data transmission within the air defense area. In the event of the loss of communication with the AADCP, the BTE will automatically go into the "round robin" mode of operation. In this mode, tactical and engagement data will be transferred directly from battery to battery.

17 (C). Block Diagram Analysis

a. The FUIF equipment in the Improved NIKE-HERCULES System with HIPAR consists of equipment in the FUIF room addition of the HIPAR building in a consolidated site, or in the FUIF portion of the electronic shop building in a nonconsolidated site. The FUIF equipment in the Improved NIKE-HERCULES System with AAR consists of equipment in the FUIF portion of the electronic shop building in both consolidated and nonconsolidated sites.

a.1. The battery terminal equipment (BTE) is mounted inside the trailer mounted director station. Tactical data is fed directly from the AADCP to the BTE.

b. The FUIF equipment or the BTE (fig. 7) accepts signals originating at the AADCP. These signals are of three types: target position coordinate data, target identification data, and tactical control data. The target position coordinate data is decoded, parallax-corrected, and processed, then is applied to the acquisition presentation system. The target position coordinate data is parallax-corrected to compensate for the difference in location between the AADCP and the RCDC. The target identification data is decoded and processed and is applied to the acquisition presentation system. The target position coordinate data and the target identification data cause a target identification symbol to appear on the PPI at the point directly above the video of the target being identified. For a detailed discussion of AADCP presentations and control, refer to chapter 7, section III.

c. The tactical control data is decoded and applied to the tactical control system in the trailer mounted director station, causing indicator lights on the tactical control-indicator (11, fig. 22) of the battery control console to illuminate or extinguish, signifying the tactical commands from the AADCP.

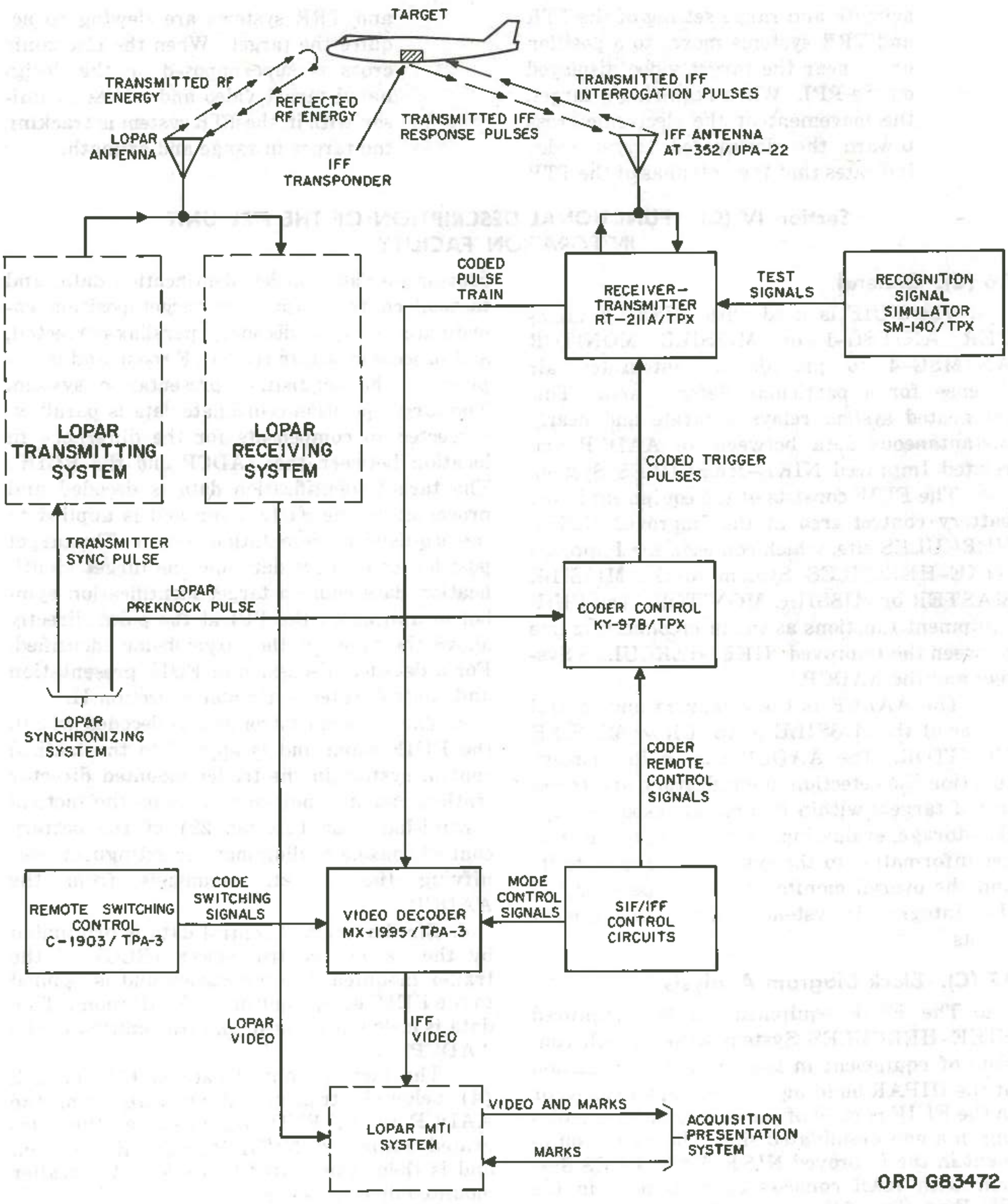

Figure 6 (U). SIF/IFF system—block diagram (U).

azimuth and range setting of the TTR and TRR systems moves to a position on or near the target video displayed on the PPI. When acquiring a target, the movement of the electronic cross toward the designated target video indicates that the antennas of the TTR and TRR systems are slewing to acquire the target. When the electronic cross is superimposed on the designated target video and moves in unison with it, the TTR system is tracking the target in range and azimuth.

Section IV (C). FUNCTIONAL DESCRIPTION OF THE FIRE UNIT INTEGRATION FACILITY

16 (C). General

a. The FUIF is used with MISSILE MASTER AN/FSG-1 or MISSILE MONITOR AN/MSG-4 to provide an integrated air defense for a particular defense area. This integrated system relays accurate and nearly instantaneous data between an AADCP and related Improved NIKE-HERCULES System.

b. The FUIF consists of the equipment in the battery control area at the Improved NIKE-HERCULES site, which connects the Improved NIKE-HERCULES System to the MISSILE MASTER or MISSILE MONITOR. The FUIF equipment functions as the interconnecting line between the Improved NIKE-HERCULES System and the AADCP.

c. The AADCP is the command and control center of the MISSILE MASTER or MISSILE MONITOR. The AADCP has as its primary function the detection, identification, and tracking of targets within its area of responsibility; the storage, evaluation, and distribution of target information to the systems connected to it; and the overall monitoring and supervising of the integrated system-to-target engagement status.

17 (C). Block Diagram Analysis

a. The FUIF equipment in the Improved NIKE-HERCULES System with HIPAR consists of equipment in the FUIF room addition of the HIPAR building in a consolidated site, or in the FUIF portion of the electronic shop building in a nonconsolidated site. The FUIF equipment in the Improved NIKE-HERCULES System with AAR consists of equipment in the FUIF portion of the electronic shop building in both consolidated and nonconsolidated sites.

b. The FUIF equipment (fig. 7) in the FUIF room accepts signals originating at the AADCP. These signals are of three types: target position coordinate data, target identification data, and tactical control data. The target position coordinate data is decoded, parallax-corrected, and processed within the FUIF room, and is applied to the acquisition presentation system. The target position coordinate data is parallax-corrected to compensate for the difference in location between the AADCP and the RCDC. The target identification data is decoded and processed in the FUIF room and is applied to the acquisition presentation system. The target position coordinate data and the target identification data cause a target identification symbol to appear on the PPI at the point directly above the video of the target being identified. For a detailed discussion of FUIF presentation and control, refer to chapter 8, section II.

c. The tactical control data is decoded within the FUIF room and is applied to the tactical control system in the trailer mounted director station, causing indicator lights on the tactical control-indicator (11, fig. 22) of the battery control console to illuminate or extinguish, signifying the tactical commands from the AADCP.

d. Similar tactical control data is originated by the battery control officer (BCO) in the trailer mounted director station and is applied to the FUIF equipment in the FUIF room. This data is coded, processed, and transmitted to the AADCP.

e. The tactical control data in (1) through (4) below is transmitted by wire from the AADCP to the FUIF equipment at the integrated Improved NIKE-HERCULES System and is then transmitted by cable to the trailer mounted director station.

(1) A remote signal illuminates an indicator light, indicating that a target is being assigned from the AADCP to the integrated Improved NIKE-HERCULES System.

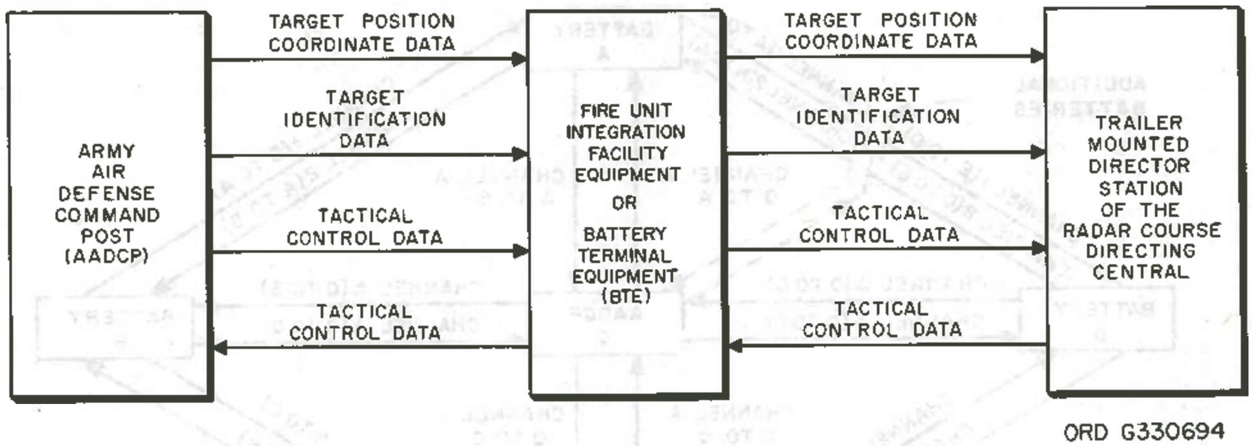

Figure 7 (U). Tactical data interface—block diagram (U).

d. Similar tactical control data is originated by the battery control officer (BCO) in the trailer mounted director station and is applied to the FUIF equipment or BTE. This data is coded, processed, and transmitted to the AADCP.

e. The tactical control data in (1) through (4) below is transmitted by wire from the AADCP to the FUIF equipment or BTE at the integrated Improved NIKE–HERCULES System and is then transmitted by cable to the trailer mounted director station.

(1) A remote signal illuminates an indicator light, indicating that a target is being assigned from the AADCP to the integrated Improved NIKE–HERCULES System.

(2) A missile-select signal illuminates an indicator light, indicating the type of missile designated by the AADCP to be used by the integrated Improved NIKE–HERCULES System for the current engagement.

(3) A hold-fire signal illuminates an indicator light and sounds a buzzer, instructing the integrated Improved NIKE–HERCULES System to destroy the airborne missile presently controlled, not to fire the next designated missile until signaled to do so, and to continue tracking the present target.

(4) A cease-fire signal illuminates an indicator light and sounds a buzzer, instructing the integrated Improved NIKE–HERCULES System to terminate the present engagement. The airborne missile presently controlled is not destroyed.

f. The tactical control data in (1) through (13) below is transmitted by cable from the BTE or from the trailer mounted director station to the FUIF equipment at the integrated Improved NIKE–HERCULES System and is then transmitted by wire to the AADCP.

(1) A target-designated signal or a target-abandon signal.

(2) A target-tracked signal.

(3) A fire signal.

(4) An acknowledge signal indicating that a command has been received from the AADCP and is acknowledged.

(5) An out-of-action signal indicating that the integrated Improved NIKE–HERCULES System is incapable of normal action.

(6) A local signal indicating that the integrated Improved NIKE–HERCULES System has returned to an action condition from an out-of-action condition.

(7) A one signal indicating that the designated target is a single aircraft.

(8) A few signal indicating that the designated target consists of two to five aircraft.

(9) A many signal indicating that the designated target consists of more than five aircraft.

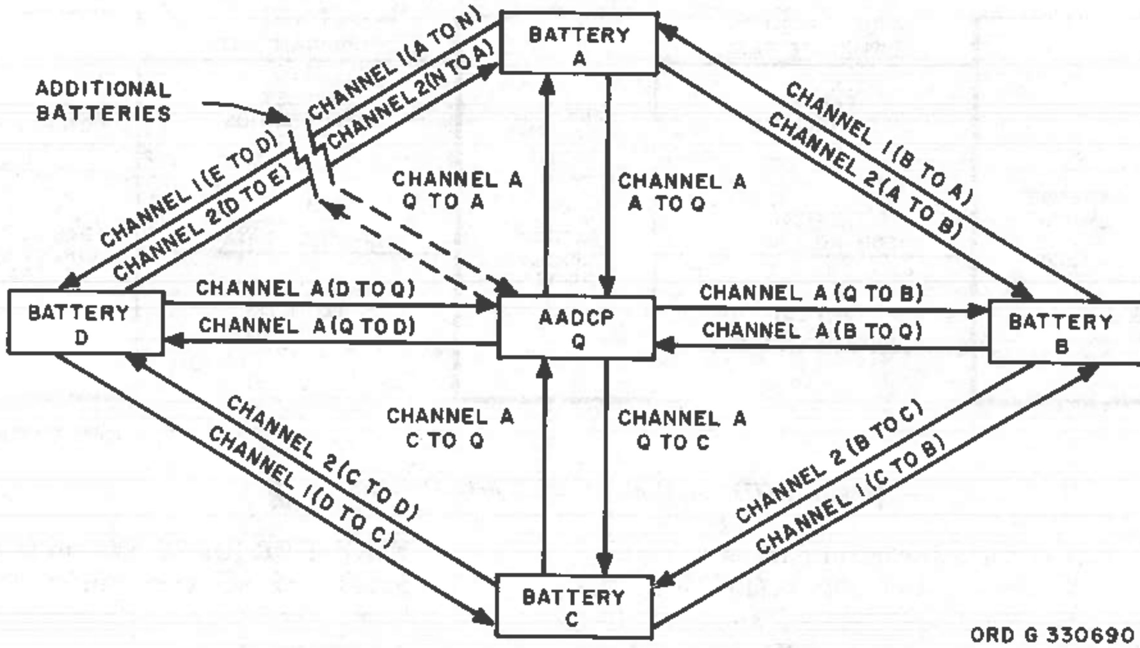

Figure 7.1 (U). Air defense area interface when using the AN/GSA battery terminal equipment (BTE) (U).

(10) An effective signal indicating that one or more aircraft was damaged.

(11) An ineffective signal indicating that the engagement was not successful.

(12) A kill signal indicating that one or more aircraft was destroyed.

(13) A validity signal indicating that the target has been validated.

g. If communication with the AADCP is interrupted for any reason (unavailability of the AADCP due to in-process deployment, equipment failure, enemy action or disruption of the data link between the Improved NIKE–HERCULES system and the AADCP, the AN/GSA-77 battery terminal equipment (BTE) has the capability of switching to the "round robin" mode of operation and permits continued transfer of target and mission data between batteries. Figure 7.1 shows BTE interface with the AADCP and with adjacent, integrated batteries.

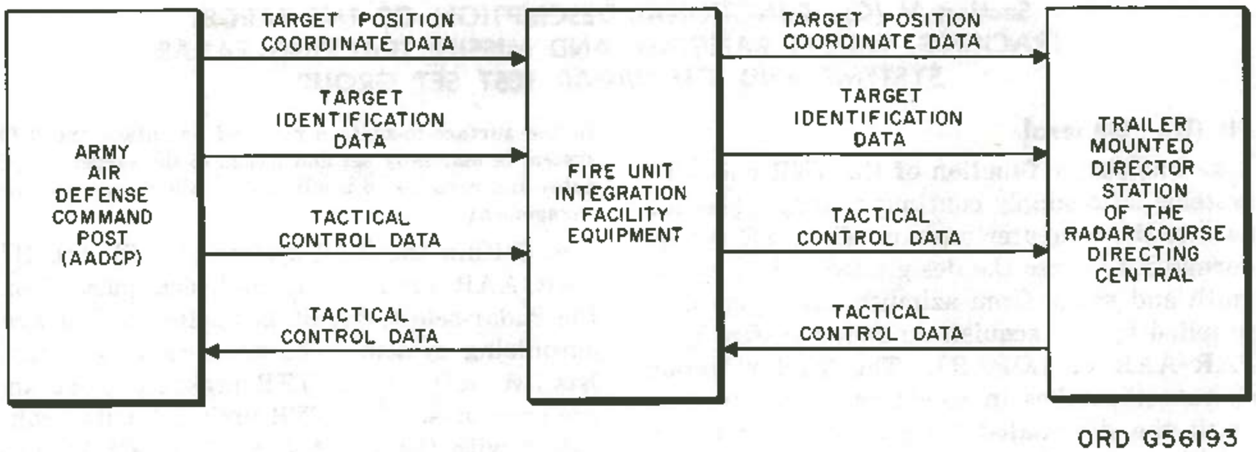

Figure 7 (U). FUIF—block diagram (U).

(2) A missile-select signal illuminates an indicator light, indicating the type of missile designated by the AADCP to be used by the integrated Improved NIKE–HERCULES System for the current engagement.

(3) A hold-fire signal illuminates an indicator light and sounds a buzzer, instructing the integrated Improved NIKE–HERCULES System to destroy the airborne missile presently controlled, not to fire the next designated missile until signaled to do so, and to continue tracking the present target.

(4) A cease-fire signal illuminates an indicator light and sounds a buzzer, instructing the integrated Improved NIKE–HERCULES System to terminate the present engagement. The airborne missile presently controlled is not destroyed.

f. The tactical control data in (1) through (13) below is transmitted by cable from the trailer mounted director station to the FUIF equipment at the integrated Improved NIKE–HERCULES System and is then transmitted by wire to the AADCP.

(1) A target-designated signal or a target-abandon signal.

(2) A target-tracked signal.

(3) A fire signal.

(4) An acknowledge signal indicating that a command has been received from the AADCP and is acknowledged.

(5) An out-of-action signal indicating that the integrated Improved NIKE–HERCULES System is incapable of normal action.

(6) A local signal indicating that the integrated Improved NIKE–HERCULES System has returned to an action condition from an out-of-action condition.

(7) A one signal indicating that the designated target is a single aircraft.

(8) A few signal indicating that the designated target consists of two to five aircraft.

(9) A many signal indicating that the designated target consists of more than five aircraft.

(10) An effective signal indicating that one or more aircraft was damaged.

(11) An ineffective signal indicating that the engagement was not successful.

(12) A kill signal indicating that one or more aircraft was destroyed.

(13) A validity signal indicating that the target has been validated.

Section V (C). FUNCTIONAL DESCRIPTION OF THE TARGET TRACKING, TARGET RANGING, AND MISSILE TRACKING RADAR SYSTEMS AND THE RADAR TEST SET GROUP

18 (U). General

a. The major function of the TTR and TRR systems is to supply continuous target position data to the computer system. The TTR system normally acquires the designated target in azimuth and range from azimuth and range data supplied by the acquisition radar system (HIPAR/AAR or LOPAR). The TTR elevation operator searches in elevation to acquire and track the designated target. Target position data in terms of range, azimuth, and elevation is continuously supplied to the computer system until the engagement is completed. The TRR system is an alternate source of range data and is used primarily during countermeasure attacks. The TRR antenna is slaved electrically in azimuth and elevation to the TTR antenna.

b. The MTR system supplies continuous missile position data to the computer system and transmits guidance and burst commands to the missile. The MTR system tracks the designated missile before launch. After launch the MTR system supplies missile elevation, azimuth, and range data to the computer system, which in turn supplies guidance commands to the missile by way of the MTR system. The MTR system automatically tracks the missile by receiving the RF response pulses transmitted by the missile.

c. The MTR and the TTR systems function similarly. The main difference between the two systems is that the MTR system utilizes a dual-purpose command system instead of the synchronizing system used in the TTR system. Basically, each radar system consists of a synchronizing or a command system; transmitting, receiving, antenna, antenna positioning, range, and presentation systems; and control circuits.

d. The radar test set group is supplied with the Improved NIKE-HERCULES System as test equipment for checking the performance of the TTR, TRR, and MTR systems.

19 (C). Block Diagram Analysis of the Target Tracking Radar System

Note. This analysis does not apply when the RCDC system is in the surface-to-surface mode of operation. In the surface-to-surface mode of operation, the TTR system is manually set and locked to the target coordinates and remains so positioned for the duration of the engagement.

a. Within the TTR system (fig. 8), the HIPAR/AAR or LOPAR preknock pulse from the radar-select circuit is applied to the synchronizing system. The synchronizing system has two outputs, the TTR preknock pulse and the sync pulse. The TTR preknock pulse, coincident with the HIPAR/AAR or LOPAR preknock pulse, is applied to the range and TRR synchronizing systems. The sync pulse triggers the transmitting system which applies high power RF energy to the antenna system.

b. The antenna system transmits, shapes, and directs the transmitted RF energy to the designated target and receives the reflected RF energy. The transmitted RF energy is shaped by the antenna system into a highly directional beam. A portion of this transmitted RF energy is reflected from the designated target back to the antenna system. The reflected RF energy is directed from the antenna system to the receiving system. The antenna positioning system positions the antenna to the azimuth and elevation angles of the target.

c. The receiving system converts the reflected RF energy into range, azimuth, and elevation video, and azimuth and elevation angle error signals. The receiving system furnishes range video to the range system during automatic operation, and azimuth and elevation video to the presentation system. The receiving system also furnishes azimuth and elevation error signals to the antenna positioning system.

d. The range system is triggered by the TTR preknock pulse from the synchronizing system. The triggering action establishes the zero time reference for the range system. The range system determines the time interval between the transmitted RF pulse and the reflected RF signal and compares this time interval with the time interval derived in the range system. When these two intervals coincide, the range specified by the range system is the slant range to the target. The range system supplies range data

Section V (C). FUNCTIONAL DESCRIPTION OF THE TARGET TRACKING, TARGET RANGING, AND MISSILE TRACKING RADAR SYSTEMS AND THE RADAR TEST SET GROUP

18 (U). General

a. The major function of the TTR and TRR systems is to supply continuous target position data to the computer system. The TTR system normally acquires the designated target in azimuth and range from azimuth and range data supplied by the acquisition radar system (HIPAR/AAR or LOPAR). The TTR elevation operator searches in elevation to acquire and track the designated target. Target position data in terms of range, azimuth, and elevation is continuously supplied to the computer system until the engagement is completed. The TRR system is an alternate source of range data and is used primarily during countermeasure attacks. The TRR antenna is slaved electrically in azimuth and elevation to the TTR antenna.

b. The MTR system supplies continuous missile position data to the computer system and transmits guidance and burst commands to the missile. The MTR system tracks the designated missile before launch. After launch the MTR system supplies missile elevation, azimuth, and range data to the computer system, which in turn supplies guidance commands to the missile by way of the MTR system. The MTR system automatically tracks the missile by receiving the RF response pulses transmitted by the missile.

c. The MTR and the TTR systems function similarly. The main difference between the two systems is that the MTR system utilizes a dual-purpose command system instead of the synchronizing system used in the TTR system. Basically, each radar system consists of a synchronizing or a command system; transmitting, receiving, antenna, antenna positioning, range, and presentation systems; and control circuits.

d. The radar test set group is supplied with the Improved NIKE-HERCULES System as test equipment for checking the performance of the TTR, TRR, and MTR systems.

19 (C). Block Diagram Analysis of the Target Tracking Radar System

Note. This analysis does not apply when the RCDC system is in the surface-to-surface mode of operation. In the surface-to-surface mode of operation, the TTR system is manually set and locked to the target coordinates and remains so positioned for the duration of the engagement.

a. Within the TTR system (fig. 8), the HIPAR/AAR or LOPAR preknock pulse from the radar-select circuit is applied to the synchronizing system. The synchronizing system has two outputs, the TTR preknock pulse and the sync pulse. The TTR preknock pulse, coincident with the HIPAR/AAR or LOPAR preknock pulse, is applied to the range and TRR synchronizing systems. The sync pulse triggers the transmitting system which applies high power RF energy to the antenna system.

b. The antenna system transmits, shapes, and directs the transmitted RF energy to the designated target and receives the reflected RF energy. The transmitted RF energy is shaped by the antenna system into a highly directional beam. A portion of this transmitted RF energy is reflected from the designated target back to the antenna system. The reflected RF energy is directed from the antenna system to the receiving system. The antenna positioning system positions the antenna to the azimuth and elevation angles of the target.

c. The receiving system converts the reflected RF energy into range, azimuth, and elevation video, and azimuth and elevation angle error signals. The receiving system furnishes range video to the range system during automatic operation, and azimuth and elevation video to the presentation system. The receiving system also furnishes azimuth and elevation error signals to the antenna positioning system.

d. The range system is triggered by the TTR preknock pulse from the synchronizing system. The triggering action establishes the zero time reference for the range system. The range system determines the time interval between the transmitted RF pulse and the reflected RF signal and compares this time interval with the time interval derived in the range system. When these two intervals coincide, the range specified by the range system is the slant range to the target. The range system supplies range data

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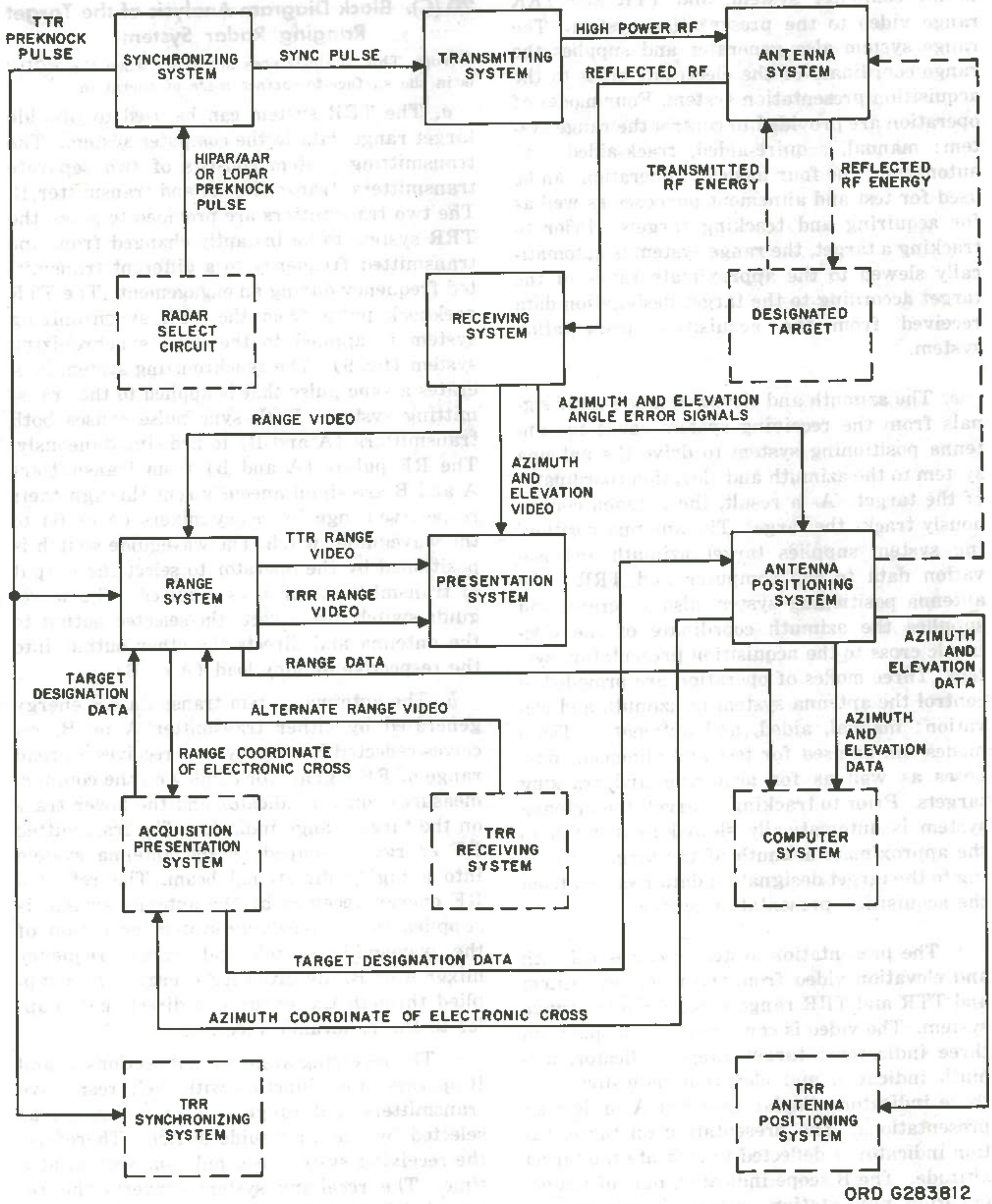

Figure 8 (U). TTR system—block diagram (U).

to the computer system, and TTR and TRR range video to the presentation system. The range system also generates and supplies the range coordinate of the electronic cross to the acquisition presentation system. Four modes of operation are provided to control the range system: manual, acquire-aided, track-aided, and automatic. The four modes of operation can be used for test and alinement purposes as well as for acquiring and tracking targets. Prior to tracking a target, the range system is automatically slewed to the approximate range of the target according to the target designation data received from the acquisition presentation system.

e. The azimuth and elevation angle error signals from the receiving system cause the antenna positioning system to drive the antenna system to the azimuth and elevation coordinates of the target. As a result, the antenna continuously tracks the target. The antenna positioning system supplies target azimuth and elevation data to the computer and TRR. The antenna positioning system also generates and supplies the azimuth coordinate of the electronic cross to the acquisition presentation system. Three modes of operation are provided to control the antenna system in azimuth and elevation: manual, aided, and automatic. These modes can be used for test and alinement purposes as well as for acquiring and tracking targets. Prior to tracking a target, the antenna system is automatically slewed in azimuth to the approximate azimuth of the target according to the target designation data received from the acquisition presentation system.

f. The presentation system receives azimuth and elevation video from the receiving system and TTR and TRR range video from the range system. The video is converted into displays on three indicators: target range indicator, azimuth indicator, and elevation indicator. The three indicators display modified A or R scan presentations. The presentation on the elevation indicator is deflected to indicate the target altitude. The B scope indicator, part of the acquisition presentation system, is provided to aid the TTR operators in acquiring designated targets.

20 (C). Block Diagram Analysis of the Target Ranging Radar System

Note. This analysis does not apply when the RCDC is in the surface-to-surface mode of operation.

a. The TRR system can be used to provide target range data to the computer system. The transmitting system consists of two separate transmitters, transmitter A and transmitter B. The two transmitters are provided to allow the TRR system to be instantly changed from one transmitted frequency to a different transmitted frequency during an engagement. The TTR preknock pulse from the TTR synchronizing system is applied to the TRR synchronizing system (fig. 9). The synchronizing system generates a sync pulse that is applied to the transmitting system. Each sync pulse causes both transmitters (A and B) to fire simultaneously. The RF pulses (A and B) from transmitters A and B are simultaneously sent through their respective range frequency mixers (A or B) to the waveguide switch. The waveguide switch is positioned by the operator to select the output of transmitter A or B as required. The waveguide switch also directs the selected output to the antenna and directs the other output into the respective dummy load (A or B).

b. The antenna system transmits RF energy generated by either transmitter A or B, receives reflected RF energy, and receives a broad range of RF signals for display on the countermeasures control-indicator and the lower trace on the target range indicator. The transmitted RF energy is shaped by the antenna system into a highly directional beam. The reflected RF energy received by the antenna system is supplied to the receiving system by action of the waveguide switch and range frequency mixer A or B. Received RF energy is also supplied through the panoramic directional coupler to the panoramic receiver.

c. The receiving system input sections A and B operate in conjunction with their respective transmitters and range frequency mixers, as selected by the waveguide switch. Therefore, the receiving system uses only one section at a time. The receiving system converts the received RF energy from the antenna system into range video. This video is supplied to the TTR range and presentation systems and to the

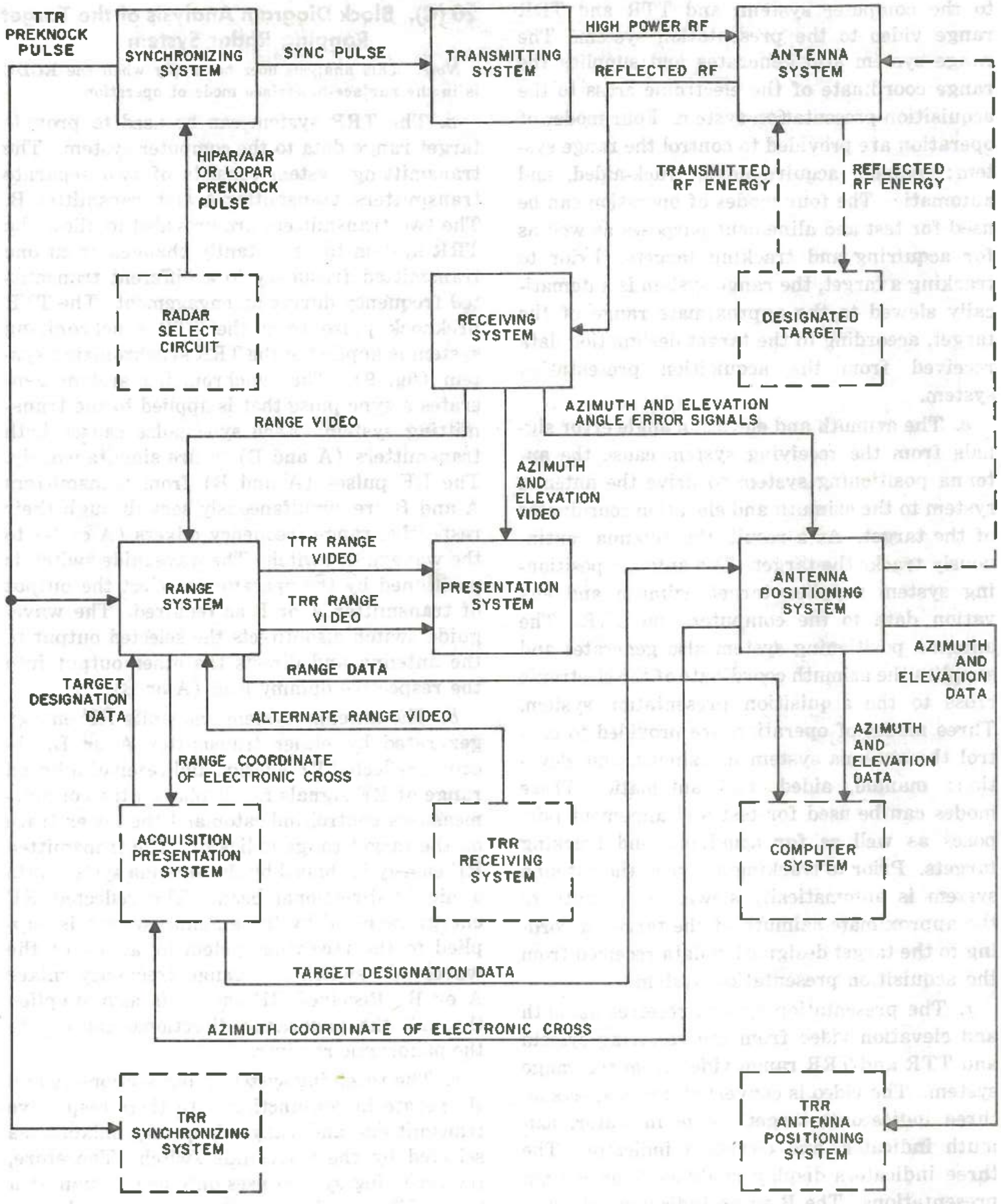

Figure 8 (U). TTR system—block diagram (U).

to the computer system, and TTR and TRR range video to the presentation system. The range system also generates and supplies the range coordinate of the electronic cross to the acquisition presentation system. Four modes of operation are provided to control the range system: manual, acquire-aided, track-aided, and automatic. The four modes of operation can be used for test and alinement purposes as well as for acquiring and tracking targets. Prior to tracking a target, the range system is automatically slewed to the approximate range of the target, according to the target designation data received from the acquisition presentation system.

e. The azimuth and elevation angle error signals from the receiving system cause the antenna positioning system to drive the antenna system to the azimuth and elevation coordinates of the target. As a result, the antenna continuously tracks the target. The antenna positioning system supplies target azimuth and elevation data to the computer and TRR. The antenna positioning system also generates and supplies the azimuth coordinate of the electronic cross to the acquisition presentation system. Three modes of operation are provided to control the antenna system in azimuth and elevation: manual, aided, and automatic. These modes can be used for test and alinement purposes as well as for acquiring and tracking targets. Prior to tracking a target, the antenna system is automatically slewed in azimuth to the approximate azimuth of the target, according to the target designation data received from the acquisition presentation system.

f. The presentation system receives azimuth and elevation video from the receiving system and TTR and TRR range video from the range system. The video is converted into displays on three indicators: target range indicator, azimuth indicator, and elevation indicator. The three indicators display modified A or R scan presentations. The B scope indicator, which is part of the acquisition presentation system, is provided to aid the TTR operators in acquiring designated targets.

20 (C). Block Diagram Analysis of the Target Ranging Radar System

Note. This analysis does not apply when the RCDC is in the surface-to-surface mode of operation.

a. The TRR system can be used to provide target range data to the computer system. The transmitting system consists of two separate transmitters, transmitter A and transmitter B. The two transmitters are provided to allow the TRR system to be instantly changed from one transmitted frequency to a different transmitted frequency during an engagement. The TTR preknock pulse from the TTR synchronizing system is applied to the TRR synchronizing system (fig. 9). The synchronizing system generates a sync pulse that is applied to the transmitting system. Each sync pulse causes both transmitters (A and B) to fire simultaneously. The RF pulses (A and B) from transmitters A and B are simultaneously sent through their respective range frequency mixers (A or B) to the waveguide switch. The waveguide switch is positioned by the operator to select the output of transmitter A or B as required. The waveguide switch also directs the selected output to the antenna and directs the other output into the respective dummy load (A or B).

b. The antenna system transmits RF energy generated by either transmitter A or B, receives reflected RF energy, and receives a broad range of RF signals for display on the countermeasures control-indicator and the lower trace on the target range indicator. The transmitted RF energy is shaped by the antenna system into a highly directional beam. The reflected RF energy received by the antenna system is supplied to the receiving system by action of the waveguide switch and range frequency mixer A or B. Received RF energy is also supplied through the panoramic directional coupler to the panoramic receiver.

c. The receiving system input sections A and B operate in conjunction with their respective transmitters and range frequency mixers, as selected by the waveguide switch. Therefore, the receiving system uses only one section at a time. The receiving system converts the received RF energy from the antenna system into range video. This video is supplied to the TTR range and presentation systems and to the

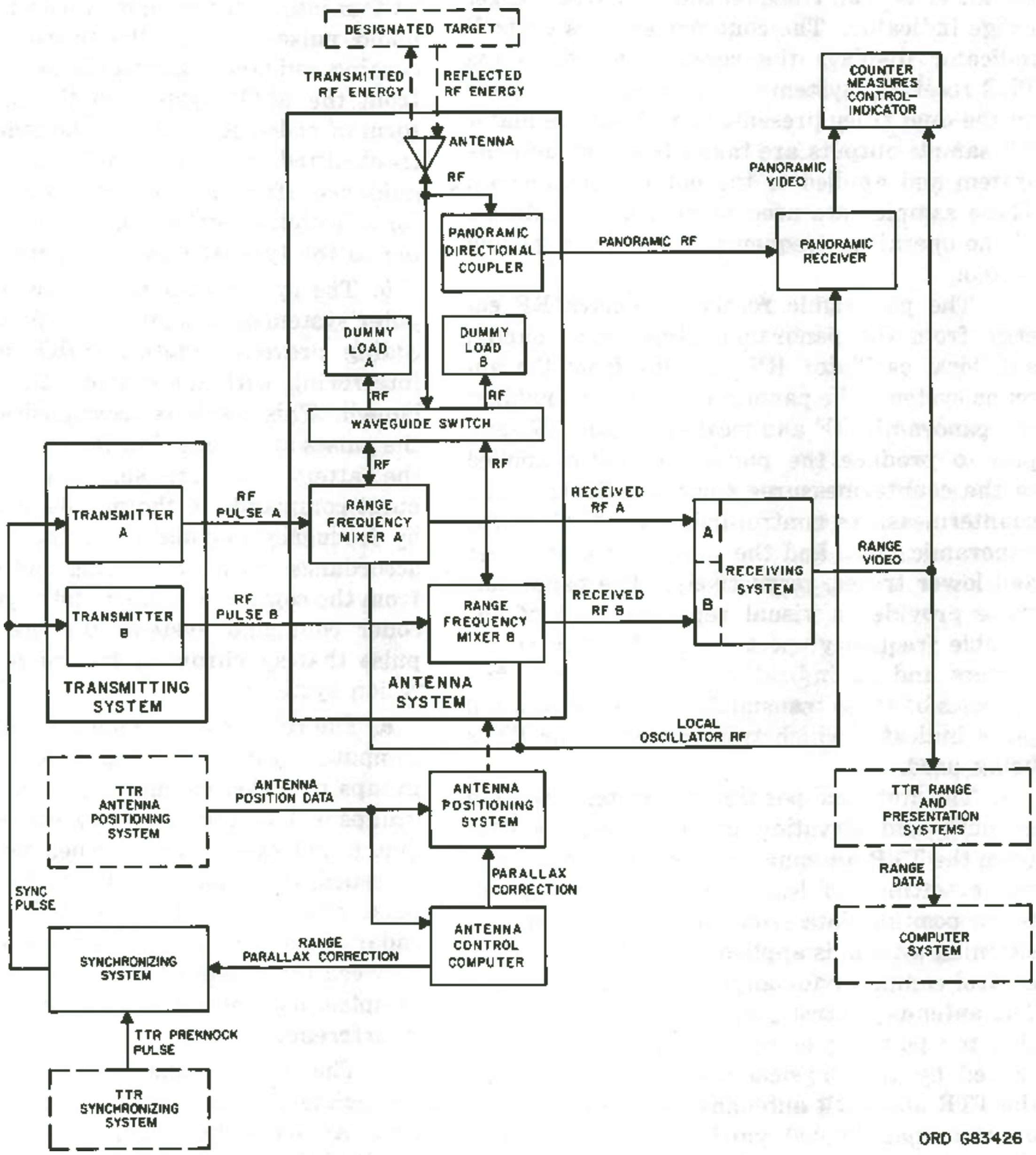

Figure 9 (U). TRR system—block diagram (U).

countermeasures control-indicator. The TTR range system uses the range video from the TRR receiving system to perform exactly the same functions as described in paragraph 19*d*. The TTR presentation system displays the range video from the TRR receiving system as the lower A scan trace on the dual trace target range indicator. The countermeasures control-indicator displays the range video from the TRR receiving system as the lower A scan trace on the dual trace presentation. Local oscillator RF sample outputs are taken from the antenna system and applied to the panoramic receiver. These samples are used to give a presentation of the operating frequency of the transmitting system.

d. The panoramic receiver receives RF energy from the panoramic directional coupler, and local oscillator RF samples from the antenna system. The panoramic receiver combines the panoramic RF and local oscillator RF samples to produce the panoramic video applied to the countermeasures control-indicator. The countermeasures control-indicator displays the panoramic video and the range video on upper and lower traces, respectively. The panoramic trace provides a visual representation of the tunable frequency spectrum of the TRR transmitters and an indication of the relative frequencies of these transmitters. Also, a pedestal pulse indicates which transmitter (A or B) is being used.

e. The antenna positioning system receives azimuth and elevation antenna position data from the TTR antenna positioning system. For range settings of less than 20,000 yards, antenna position data from the TTR antenna positioning system is applied through the antenna control computer for angle parallax correction. The antenna control computer provides correction for pointing errors (parallax correction) caused by the physical displacement between the TTR and TRR antennas. At range settings greater than 20,000 yards, the azimuth and elevation errors caused by displacement are insignificant. The antenna control computer also supplies range parallax correction for all range settings to the synchronizing system and modifies the sync pulse timing so that the apparent ranges from the TTR and TRR systems to a given target are the same.

21 (C). Block Diagram Analysis of the Missile Tracking Radar System

a. The MTR system (fig. 10) uses a sync command system and a radar coder command system. Each command system converts the steering and burst orders from the computer system into coded command pulses. These command pulses trigger the transmitting system causing guidance commands to be transmitted from the MTR system to the missile in the form of coded RF pulses. The coded RF pulses transmitted to the missile provide missile guidance after launch. Switching is provided for selection of either command system according to the type of missile designated.

b. The sync command system converts computer system orders into coded-pulse pairs. The coding prevents another NIKE battery from interfering with the control of a missile after launch. This result is accomplished by spacing the pulses at precise time intervals representing the battery code. Transmission of guidance and burst commands to the missile is accomplished by frequency modulation of the pulse pairs in accordance with the steering and burst orders from the computer system. Both sync and radar coder command systems produce a preknock pulse that synchronizes the range and presentation systems.

c. The radar coder command system converts computer system steering orders into 4-pulse groups of coded command pulses. The 4-pulse groups include the battery code and the steering (pitch and yaw) orders. When the burst order is issued, the command system develops a fifth pulse which is added to the 4-pulse groups. The radar coder command system uses the spacing between the pulses of the 4-pulse groups to accomplish both missile control and prevention of interference.

d. The transmitting system generates coded RF pulses that are applied to the antenna system. An RF pulse is generated for each pulse received from the command system.

e. The antenna system functions similarly to the TTR antenna system described in paragraph 19*b*. The main difference is that the MTR antenna system transmits coded RF pulses which carry guidance and burst commands, and receives RF response pulses transmitted by the

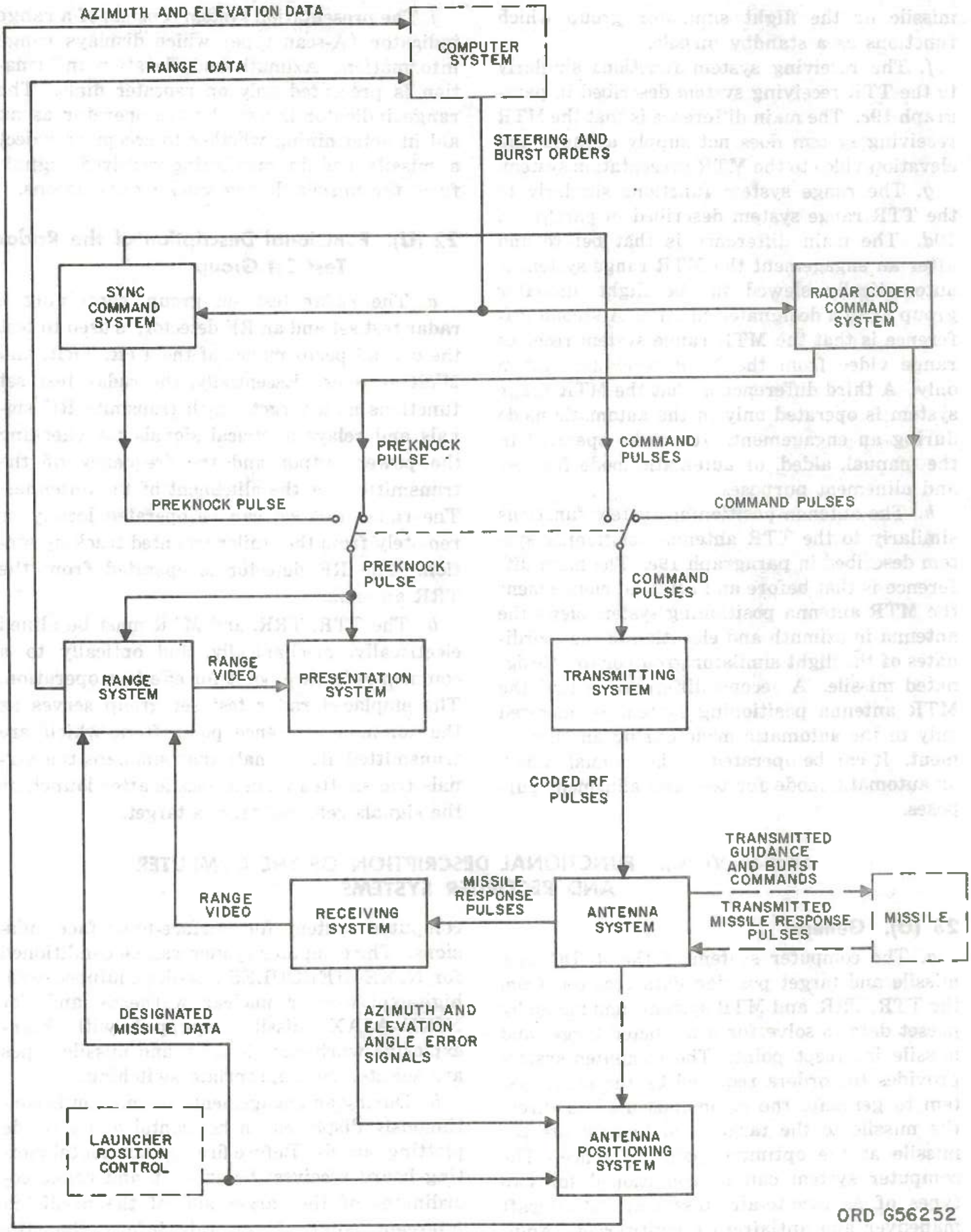

Figure 10 (U). MTR system—block diagram (U).

missile or the flight simulator group which functions as a standby missile.

f. The receiving system functions similarly to the TTR receiving system described in paragraph 19*c*. The main difference is that the MTR receiving system does not supply azimuth and elevation video to the MTR presentation system.

g. The range system functions similarly to the TTR range system described in paragraph 19*d*. The main difference is that before and after an engagement the MTR range system is automatically slewed to the flight similator group or to a designated missile. A second difference is that the MTR range system receives range video from the MTR receiving system only. A third difference is that the MTR range system is operated only in the automatic mode during an engagement. It can be operated in the manual, aided, or automatic mode for test and alinement purposes.

h. The antenna positioning system functions similarly to the TTR antenna positioning system described in paragraph 19*e*. The main difference is that before and after an engagement the MTR antenna positioning system slews the antenna in azimuth and elevation to the coordinates of the flight similator group or to a designated missile. A second difference is that the MTR antenna positioning system is operated only in the automatic mode during an engagement. It can be operated in the manual, aided, or automatic mode for test and alinement purposes.

i. The presentation system consists of a range indicator (A-scan type) which displays range information. Azimuth and elevation information is presented only on repeater dials. The range indicator is used by the operator as an aid in determining whether to accept or reject a missile and in monitoring received signals from the missile during tracking operations.

22 (U). Functional Description of the Radar Test Set Group

a. The radar test set group, containing a radar test set and an RF detector, is used to test the overall performance of the TTR, TRR, and MTR systems. Essentially, the radar test set functions as a target which transmits RF signals and relays electrical signals for checking the power output and the frequency of the transmitters or the alinement of the antennas. The radar test set can be operated locally or remotely from the trailer mounted tracking station. The RF detector is operated from the TRR antenna.

b. The TTR, TRR, and MTR must be alined electrically, mechanically, and optically to a common reference point for effective operation. The emplaced radar test set group serves as the common reference point from which are transmitted RF signals that simulate the signals transmitted from a missile after launch or the signals reflected from a target.

Section VI (C). FUNCTIONAL DESCRIPTION OF THE COMPUTER AND RECORDER SYSTEMS

23 (U). General

a. The computer system of the RCDC uses missile and target position data received from the TTR, TRR, and MTR systems and manually preset data to solve for a predicted target and missile intercept point. The computer system provides the orders required by the MTR system to generate the commands used to direct the missile to the target and to detonate the missile at the optimum point in space. The computer system can be conditioned for two types of surface-to-air missions: antiaircraft maneuver and antiaircraft multitarget. Additional circuits are provided to condition the computer system for surface-to-surface missions. The computer system can be conditioned for NIKE-HERCULES missiles equipped with high-explosive or nuclear warheads and for NIKE-AJAX missiles equipped with high-explosive warheads. Mission and missile types are selected by appropriate switching.

b. During an engagement information is continuously displayed on horizontal and altitude plotting boards. Before fire, the horizontal plotting board receives the azimuth and range coordinates of the target and of the predicted intercept point. From this information the BCO evaluates range and azimuth for both pre-

dicted intercept point and present target position. Prior to the time the missile is fired, the left pen of the altitude plotting board plots only time. The right pen of the altitude plotting board plots altitude of the predicted intercept point against predicted missile time of flight. After evaluating the information displayed and the tactical situation, the battery control officer determines the type of mission, type of missile and warhead, and the optimum time to fire. The plotting boards continue to follow the engagement after the missile is fired, displaying target and missile position information. The horizontal plotting board displays range and azimuth of the target and the missile. The left pen of the altitude plotting board plots height of the missile against time while the right pen plots height of the target against time.

c. During the engagement, continuous equipment performance data is sent to the recorder system where a complete record of battery activity for the mission is photographically recorded.

24 (C). Block Diagram Analysis of the Computer System

The computer system has three operating phases: prelaunch, initial dive and turn, and steering. These three phases are described in *a* through *c* below.

a. Prelaunch Phase. When a target is designated, the computer system (fig. 11) receives target azimuth, elevation, and range data from the TTR system. This position data is applied to the target coordinate converter and velocity determining circuits. The coordinate converter changes the target position in spherical coordinates to target position in rectangular coordinates. The target coordinate converter and velocity determining circuits apply present target position and velocity to the burst point solver. These signals are combined with launcher parallax and burst point offset data to determine the burst point coordinates. The primary output of the computer system before fire is the gyro azimuth preset data which is sent to the missile on the launcher to assure that the missile will roll toward the predicted intercept point during roll stabilization. The gyro azimuth preset data is frozen at fire to allow the gyro azimuth servo loop at the launching area to settle out before missile launch.

b. Initial Turn Phase. After the fire command is given, the missile is launched and boost phase begins. After rocket motor cluster separation and roll stabilization the computer system supplies an initial dive order to the missile through the MTR system. It also supplies an initial turn order if the missile must execute a skirting turn around the forbidden zone (over-the-shoulder, fig. 12). The rate at which the missile is ordered to dive is a function of the initial dive and turn solver (fig. 11) and is based on the range and height of the predicted burst point and the radar parallax. The requirement for an initial dive always exists; however, a comparison of the burst point coordinates and the missile position coordinates may require an initial turn order so that the missile will skirt the MTR forbidden zone. The climb and dive (pitch) steering phase begins at on-trajectory; the turn (yaw) steering phase begins at radar cleared. On-trajectory occurs when the climb and dive steering error in the computer system first reaches zero. At this time, the initial dive order is no longer sent to the missile. In a normal engagement, radar cleared occurs as soon after fire as the computer system can determine that the missile need not execute a skirting turn. In an over-the-shoulder engagement, radar cleared occurs as soon as the missile passes the forbidden zone. At this time, in an over-the-shoulder engagement, the initial turn order is no longer sent to the missile.

c. Steering Phase. After the missile is on trajectory, the steering order circuits in the computer system continuously recompute the intercept point and correct the missile trajectory by sending steering orders to the MTR system where they are converted into guidance commands and transmitted to the missile. Missile and target position, velocity data, and manually set radar parallax and burst point offset data are used by the computer system to determine the time at which a burst order will achieve a maximum kill probability. At this time the computer sends a burst order to the MTR where it is converted into a burst command and transmitted to the missile. After burst, the computer system resets to the prelaunch condition.

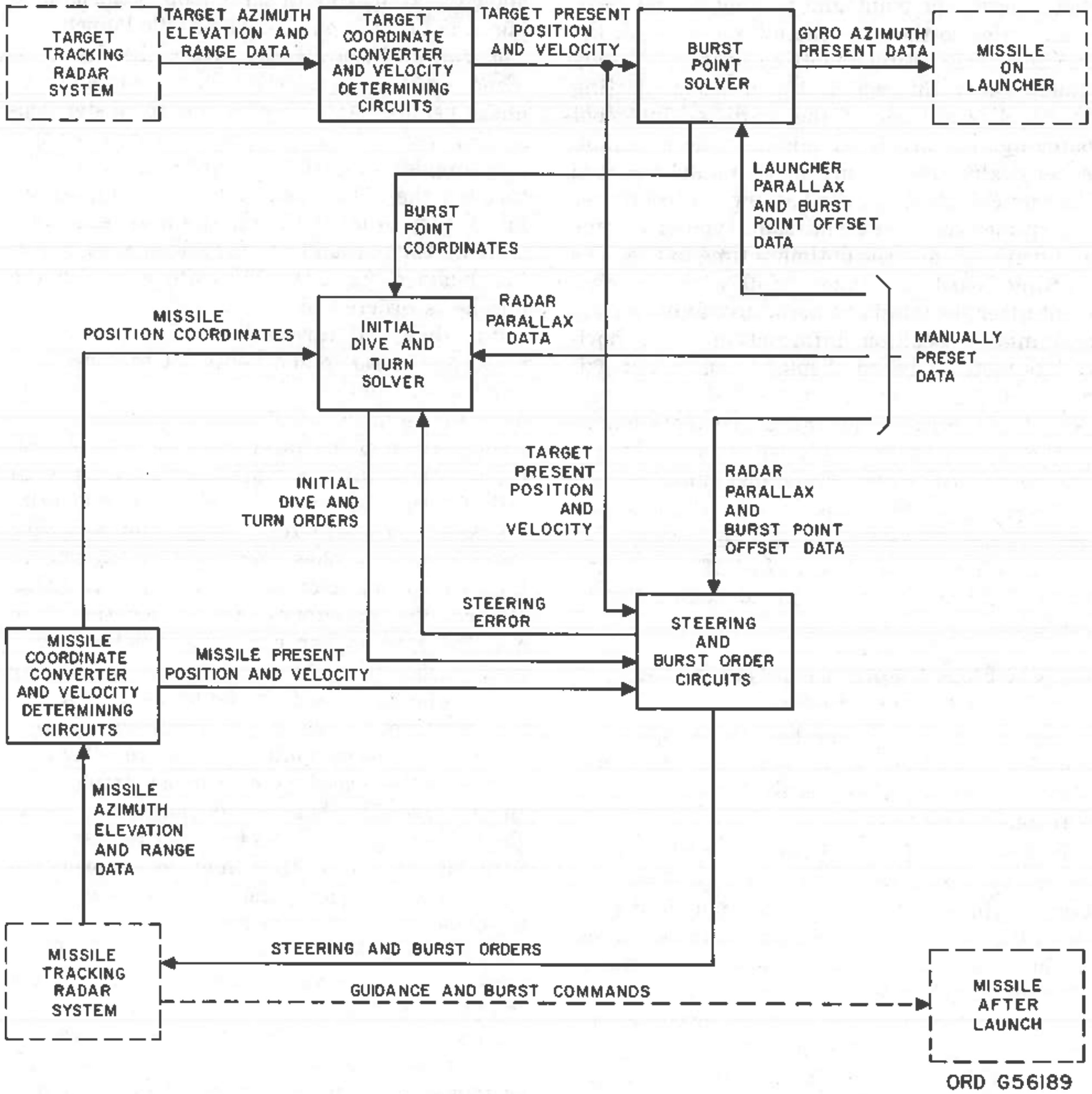

Figure 11 (U). Computer system—block diagram (U).

25 (C). Computer Missions

a. Surface-to-Air Mission. The computer system solution for a surface-to-air mission is described in paragraph 24.

b. Surface-to-Surface Mission. The computer system solution for a surface-to-surface mission is similar to the solution for the surface-to-air mission described in paragraph 24, with the following exceptions. The target position is fixed and its coordinates are manually set and locked into the TTR system for use in the computer system. A displaced aiming point is used. When the time to the displaced aiming point is equal to the final dive time setting in the computer system, the missile is ordered on a trajectory that results in a vertical dive on the target. The burst command is initiated by the computer system when the MTR system

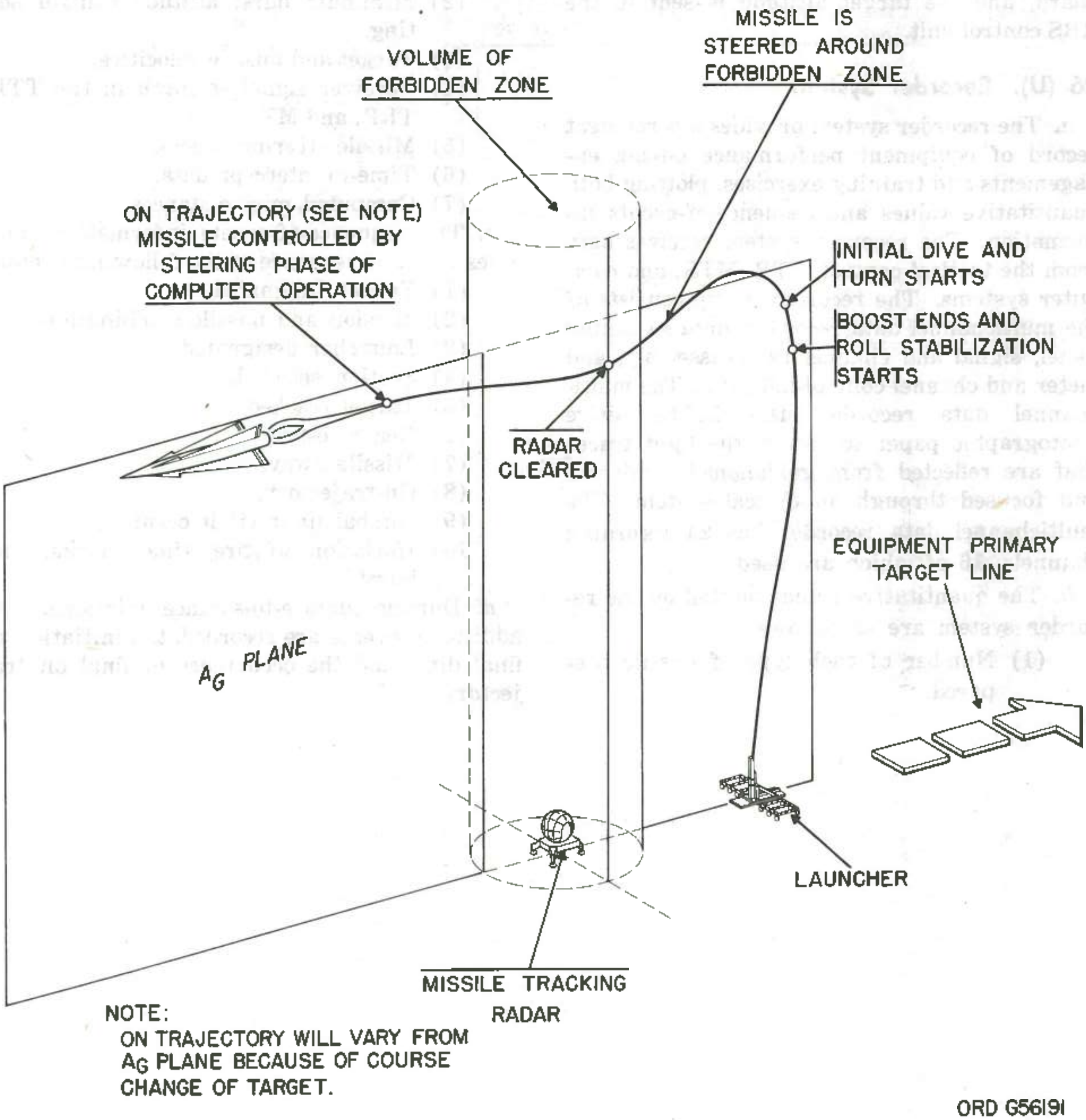

Figure 12 (U). Missile trajectory during initial turn (over-the-shoulder) phase of computer operation (U).

guidance cutoff switch closes. This switch closes a short time before the missile descends below the radar horizon during final dive. The burst command enables a barometric fuze, causes the missile to roll 180 degrees to compensate for inherent bias effects, and disables the missile receiver. The missile continues on a near vertical ballistic free-fall without ground guidance until the missile warhead is detonated by the preset barometric fuze.

c. Radar Bomb Scoring Mission. The computer system solves the RBS mission. The computer takes target position data from the TTR and converts this data into the azimuth, range, and altitude of the target. The target azimuth and range are sent to the horizontal plotting

board, and the target altitude is sent to the RBS control unit.

26 (U). Recorder System

a. The recorder system provides a permanent record of equipment performance during engagements and training exercises, plotting both quantitative values and sequence-of-events information. The recorder system receives data from the tactical control, TTR, MTR, and computer systems. The recorder group consists of the multichannel data recorder, data switching panel, signal and channel relay assembly, and meter and channel control-indicator. The multichannel data recorder uses light-sensitive photographic paper to record the light traces that are reflected from galvanometer mirrors and focused through an optical system. The multichannel data recorder has 24 recording channels, 16 of which are used.

b. The quantitative values plotted by the recorder system are as follows:

(1) Number of each type of missile prepared.

(2) Minimum burst altitude control setting.

(3) Target and missile velocities.

(4) Receiver signal strength in the TTR, TRR, and MTR.

(5) Missile steering orders.

(6) Time-to-intercept data.

(7) Computed miss distances.

c. The sequence-of-events information indicates the time sequence of the following events:

(1) Target designated.

(2) Mission and missile combination.

(3) Launcher designated.

(4) Section selected.

(5) Target tracked.

(6) Ready-to-fire.

(7) Missile away.

(8) On-trajectory.

(9) Gimbal limit (if it occurs).

(10) Initiation of fire, time marks, and burst.

d. During surface-to-surface missions, two additional events are recorded, the initiation of final dive, and the occurrence of final on trajectory.

CHAPTER 3 (C)

PHYSICAL DESCRIPTION AND DATA OF MAJOR COMPONENTS OF THE RADAR COURSE DIRECTING CENTRAL

Section I (U). OVERALL PHYSICAL DESCRIPTION OF THE RADAR COURSE DIRECTING CENTRAL

27 (U). General

The RCDC described in this manual is emplaced in a fixed Continental United States (CONUS) site. The two basic RCDC site configurations described are the inline configuration and the "T" configuration, each having specific advantages of minimum radar masking or of equipment location and real estate economy. Variations of the two basic configurations are employed as dictated by site characteristics. The area in which the RCDC is emplaced is designated the battery control area and is preferably situated on high ground so that the best possible radar coverage is obtained. The two basic site configurations are described in paragraphs 28 and 29.

Note. The term "primary target line" is defined as the line bisecting the sector in which targets are most likely to be engaged by the battery in the event of an attack. The RCDC is preferably arranged to provide maximum coverage in the direction of the primary target line, although individual site characteristics may make a different orientation of equipment necessary. The term "equipment primary target line" (3, fig. 13) is defined by the actual equipment arrangement in an individual site and is not necessarily the same as the primary target line.

28 (U). Inline Configuration

The inline configuration of the RCDC provides minimum radar masking and for this reason is preferred to the "T" configuration described in paragraph 29. The inline configuration can be either nonconsolidated or consolidated. The two types of inline configurations are described in *a* and *b* below.

Note. The key numbers shown in parentheses in *a* below refer to figure 13.

a. Nonconsolidated Site. The nonconsolidated inline configuration (fig. 13) is employed if it is practical to relocate equipment when a NIKE-HERCULES System is converted to an Improved NIKE-HERCULES System. The electronic shop building and FUIF room (11), and power building (5) used in the NIKE-HERCULES System are retained when the site is converted to the Improved NIKE-HERCULES System. In systems with HIPAR/AAR the radar antenna support set (2) or the AAR antenna group (13) and the concrete base (14) are located along the equipment primary target line. The trailer mounted tracking station (7) and trailer mounted director station (12) are joined to the electronic shop building. The LOPAR antenna-receiver-transmitter group (8) is located to either side of the equipment primary target line, a minimum of 100 feet from the nearest track or range antenna-receiver-transmitter group, a minimum of 50 feet from both the trailer mounted tracking station and the trailer mounted director station. The radar test set group (1) is located from 600 to 680 feet from the equipment primary target line and is equidistant from the target track antenna-receiver-transmitter group and the missile track antenna-receiver-transmitter group. For a more detailed discussion of the siting requirements, refer to TM 9-1430-251-10/2.

b. Consolidated Site. The consolidated inline configuration is employed in new sites for the Improved NIKE-HERCULES System. The layout is similar to the nonconsolidated inline configuration described in *a* above, except that the electronic shop building (11, fig. 13) is omitted and the trailer mounted tracking station (3, fig. 14) and trailer mounted director station (2, fig. 14) are joined to the HIPAR building (4, fig. 14). A FUIF room (1, fig. 14) is appended to the HIPAR building (4, fig. 14). In a consolidated site, the FUIF room houses the FUIF equipment which, in a nonconsoli-

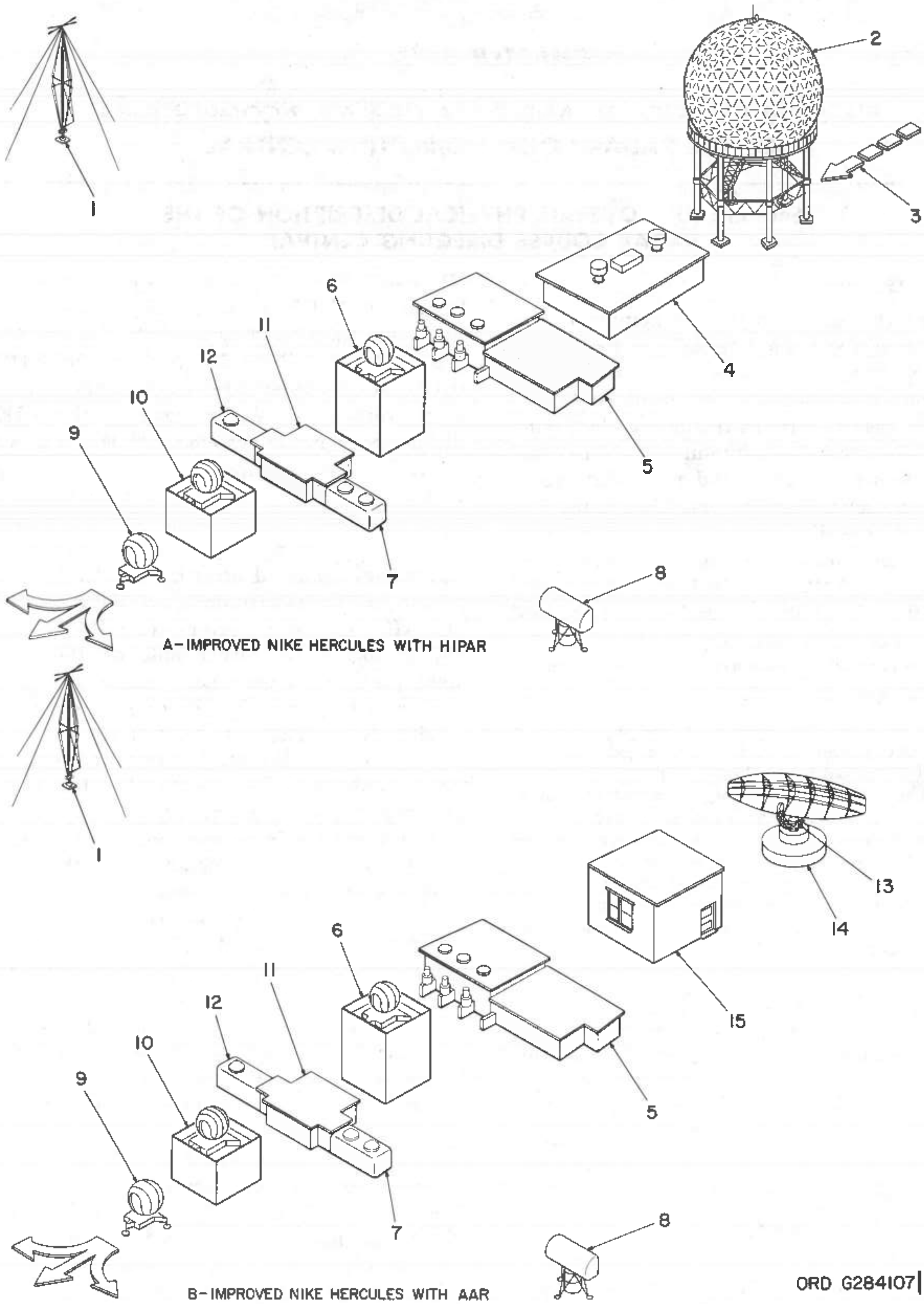

Figure 13 (U). RCDC—nonconsolidated inline configuration—typical layout (U).

1—Radar test set group
2—Radar antenna support set and radome
3—Equipment primary target line
4—HIPAR building
5—Power building
6—Target track antenna-receiver-transmitter group
7—Trailer mounted tracking station
8—LOPAR antenna-receiver-transmitter group
9—Missile track antenna-receiver-transmitter group
10—Target range antenna-receiver-transmitter group
11—Electronic shop building and FUIF room
12—Trailer mounted director station
13—AAR antenna group
14—Concrete base
15—AAR shelter

Figure 13 (U). RCDC—nonconsolidated inline configuration—typical layout —legend (U).

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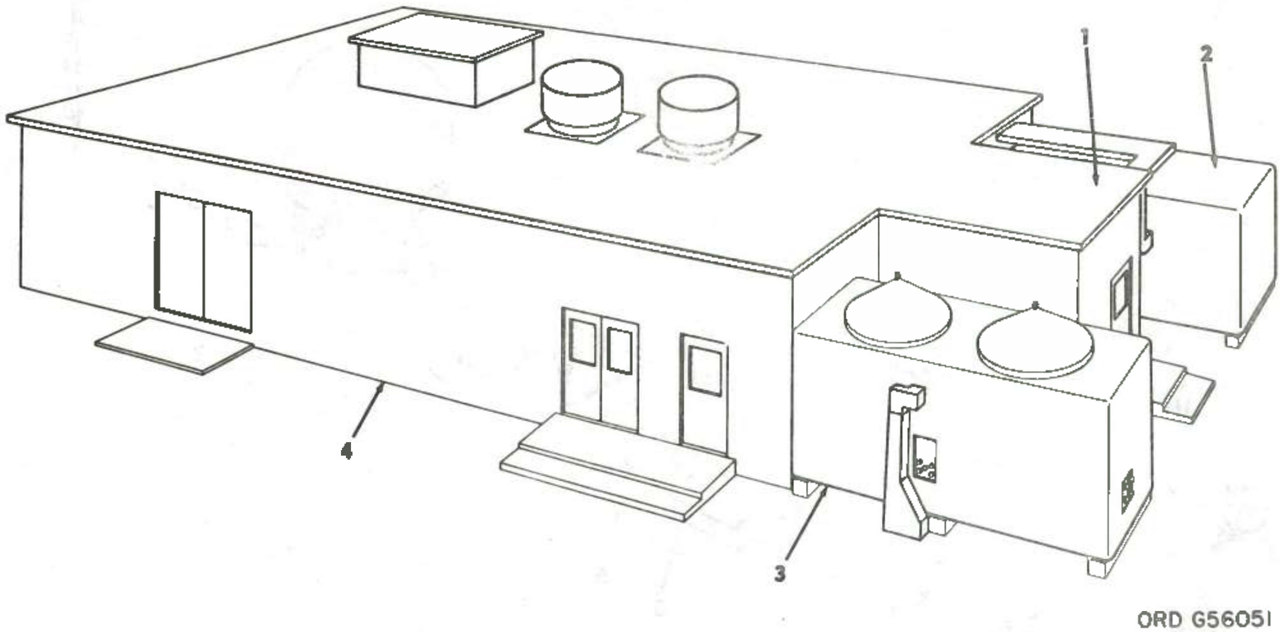


1—FUIF room
2—Trailer mounted director station
3—Trailer mounted tracking station
4—HIPAR building

Figure 14 (U). HIPAR building—consolidated site (U).

dated site, is housed in the electronic shop building.

29 (U). "T" Configuration

a. The "T" configuration (fig. 15) of the RCDC makes economical use of real estate and provides convenient arrangement of equipment. The "T" configuration is nonconsolidated and is employed at sites converted from the NIKE–HERCULES System to the Improved NIKE–HERCULES System when lack of available real estate, unfavorable terrain characteristics, or the cost of relocating emplaced equipment prohibits conversion to an inline configuration.

Note. The key numbers shown in parentheses in *b* below refer to figure 15.

b. In the "T" configuration, the radar antenna support set and radome (3), or the AAR antenna (13) and concrete base (14), HIPAR building (4), or the AAR shelter (15), and electronic shop building and FUIF room (6) are arranged on the equipment primary target line (2). The target track and missile track antenna-receiver-transmitter groups (9 and 11) are located forward of the other RCDC equipment and on a line perpendicular to the equipment primary target line. The target range antenna-receiver-transmitter group (8) is located near the target track antenna-receiver-transmitter group. The radar test set group (1) is emplaced behind the radar antenna support set and radome within 80 feet of the equipment primary target line. The trailer mounted tracking station (5) and trailer mounted director station (7) are joined to the electronic shop building. The power building (12) is near the electronic shop building. The LOPAR antenna-receiver-transmitter group (10) is located a minimum of 100 feet from the nearest target track or target range antenna-receiver-transmitter group and a minimum of 50 feet from both the trailer mounted director station and the trailer mounted tracking station. For a more detailed discussion of the siting requirements, refer to TM 9-1430-251-10/2.

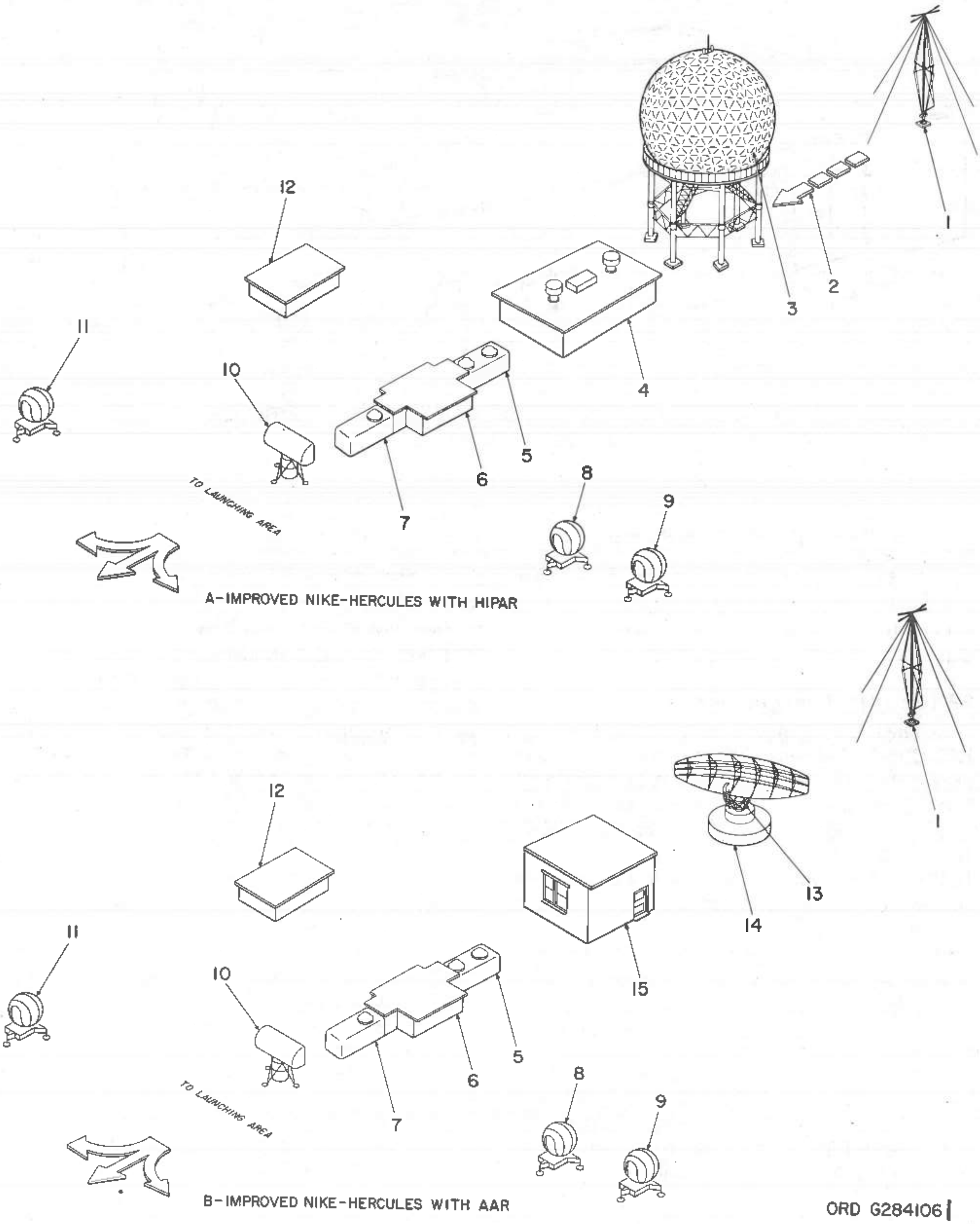


Figure 15 (U). RCDC—nonconsolidated "T" configuration—typical layout (U).

1—Radar test set group
2—Equipment primary target line
3—Radar antenna support set and radome
4—HIPAR building
5—Trailer mounted tracking station
6—Electronic shop building and FUIF room
7—Trailer mounted director station
8—Target range antenna-receiver-transmitter group
9—Target track antenna-receiver-transmitter group
10—LOPAR antenna-receiver-transmitter group
11—Missile track antenna-receiver-transmitter group
12—Power building
13—AAR antenna group
14—Concrete base
15—AAR shelter

Figure 15 (U). RCDC—nonconsolidated "T" configuration—typical layout —legend (U).

Section II (U). PHYSICAL DESCRIPTION OF THE TRAILER MOUNTED DIRECTOR STATION

30 (U). General

a. In a fixed CONUS site, the trailer mounted director station is joined either to the electronic shop building, as shown in figure 13, or to the HIPAR building, as shown in figure 14. In either configuration, the entrance door at the rear of the trailer is removed and access to the trailer is through the adjoining building. The undercarriage of the trailer is also removed and the trailer is supported on blocks or beams.

Note. The key numbers shown in parentheses in *b* below refer to figure 16.

b. Major components of the trailer mounted director station are the computer group (3), early warning plotting board (5), auxiliary acquisition control interconnecting group (6), battery control console (14), recorder group (16), personnel heater (17), director station group (18), utility cabinet (19), and equipment cooling cabinet (20). These components are described in paragraphs 31 through 38. Trailer lighting equipment is described in paragraph 39 and miscellaneous equipment is described in paragraph 40.

31 (U). Computer Group

The computer group (3, fig. 16) consists of the computer amplifier-relay group (3A, fig. 16), servo computer assembly (3B, fig. 16), and

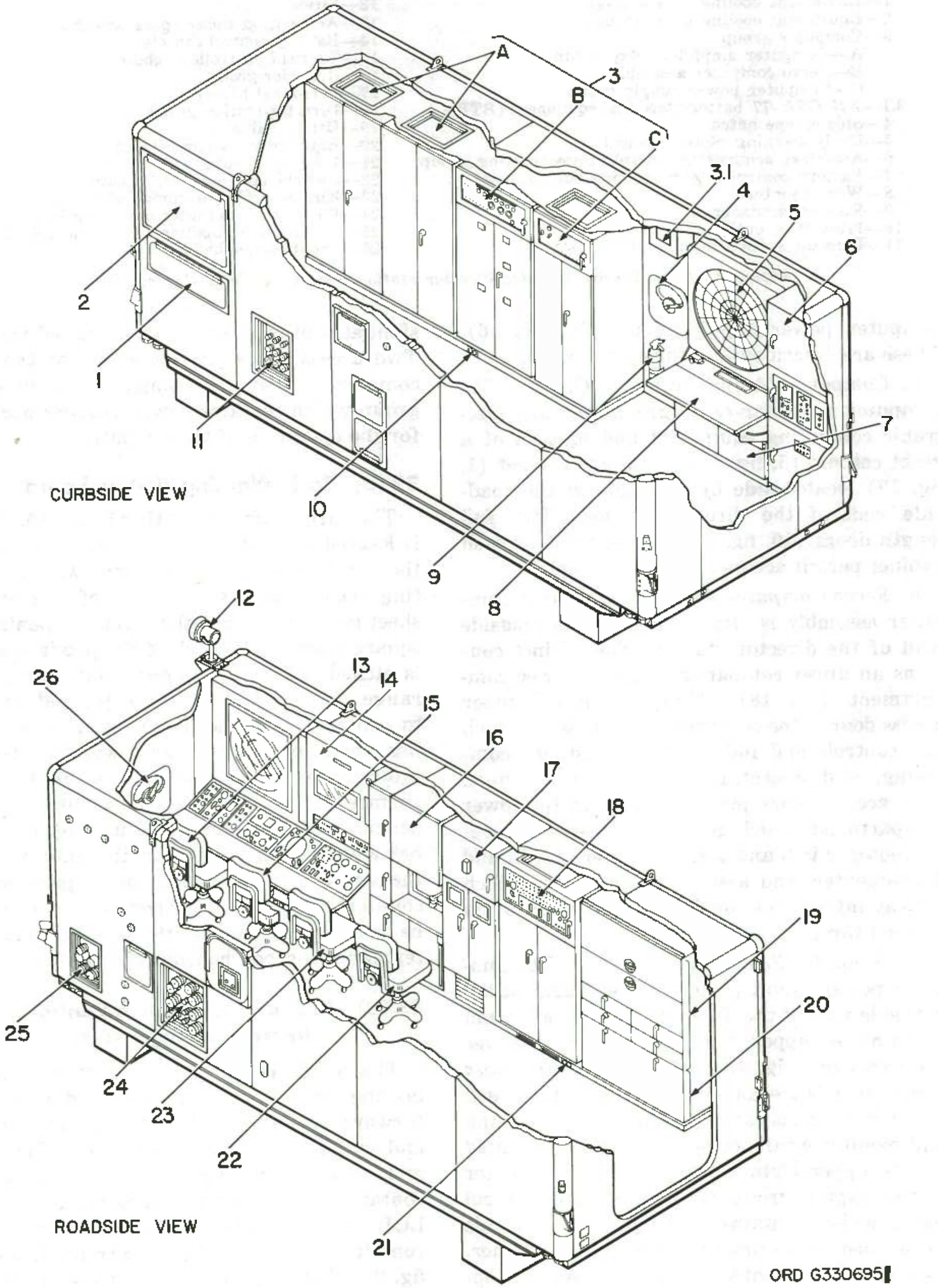


Figure 16 (U). Trailer mounted director station—cutaway views (U).

1—Equipment cooling intake cover
2—Equipment cooling exhaust cover
3—Computer group
A—Computer amplifier-relay group
B—Servo computer assembly
C—Computer power supply group
3.1—AN/GSA-77 battery terminal equipment (BTE)
4—Side escape hatch
5—Early warning plotting board
6—Auxiliary acquisition control interconnecting group
7—Battery control interconnecting box housing
8—Work counter
9—Fire extinguisher
10—110-volt ac outlet (2)
11—Director station interconnecting box
12—Siren
13—Acquisition radar operator's chair
14—Battery control console
15—Tactical controller's chair
16—Recorder group
17—Personnel heater
18—Director station group
19—Utility cabinet
20—Equipment cooling cabinet
21—110-volt ac outlet (2)
22—Switchboard operator's chair
23—Fire control operator's chair
24—Battery control interconnecting box
25—Auxiliary acquisition interconnecting box
26—Front escape hatch

Figure 16 (U). Trailer mounted director station—cutaway views—legend (U).

computer power supply group (3C, fig. 16). These are described in *a* through *c* below.

a. Computer Amplifier-Relay Group. The computer amplifier-relay group contains electronic computing equipment and consists of a right cabinet (5, fig. 17) and a left cabinet (1, fig. 17) located side by side against the roadside wall of the director station. Two full length doors (10, fig. 17) on the front of each cabinet permit access to the equipment.

b. Servo Computer Assembly. The servo computer assembly is located against the roadside wall of the director station. The cabinet contains an upper compartment and a lower compartment (fig. 18). Mounted on an upper access door is the computer control-panel which has controls and indicators for testing, monitoring, and operating the computer system. Two access doors provide access to the lower compartment which contains time-to-intercept computer, climb and turn computer, A_G, B, and T_D computer, and associated equipment which display information on five dials. The dials can be read through windows on the doors.

c. Computer Power Supply Group. The computer power supply group is located against the roadside wall of the director station trailer and contains an upper compartment and a lower compartment (fig. 19). Mounted on an upper access door is the computer power control panel which has controls and indicators for energizing and monitoring the computer system. Mounted on the upper right-hand side of the computer power supply group is the simulator control panel which contains indicators and controls to be used in conjunction with the T1 trainer. The simulator control panel provides the operator with the facility for selecting a live or simulated missile for use in simulated missions. Two access doors provide access to the lower compartment of the computer power supply group which contains power supplies necessary for the operation of the computer.

32 (U). Early Warning Plotting Board

The early warning plotting board (5, fig. 16) is located against the forward roadside wall of the director station. The early warning plotting board (fig. 20) consists of a plexiglass sheet mounted flush with a circular opening in a square frame. The back of the plexiglass sheet is etched with lines representing azimuth and range. The etched lines are printed in black to contrast with the white background. During operation, target early warning position information is manually plotted on the front surface of the plotting board with a grease pencil. A work counter (8, fig. 16) is located below the plotting board for the convenience of the early warning plotting board operator. The counter is hinged and, when not required, can be folded down against the battery control interconnecting box housing (7, fig. 16).

33 (U). Auxiliary Acquisition Control Interconnecting Group

The auxiliary acquisition control interconnecting group (6, fig. 16) is located against the forward roadside wall of the director station and contains three compartments. The upper and middle compartments (1 and 2, fig. 21) contain electrical equipment associated with the LOPAR AJD. The middle compartment also contains the IFF auxiliary control-indicator (3, fig. 21), LOPAR auxiliary control-indicator (4, fig. 21), and HIPAR auxiliary control-indicator

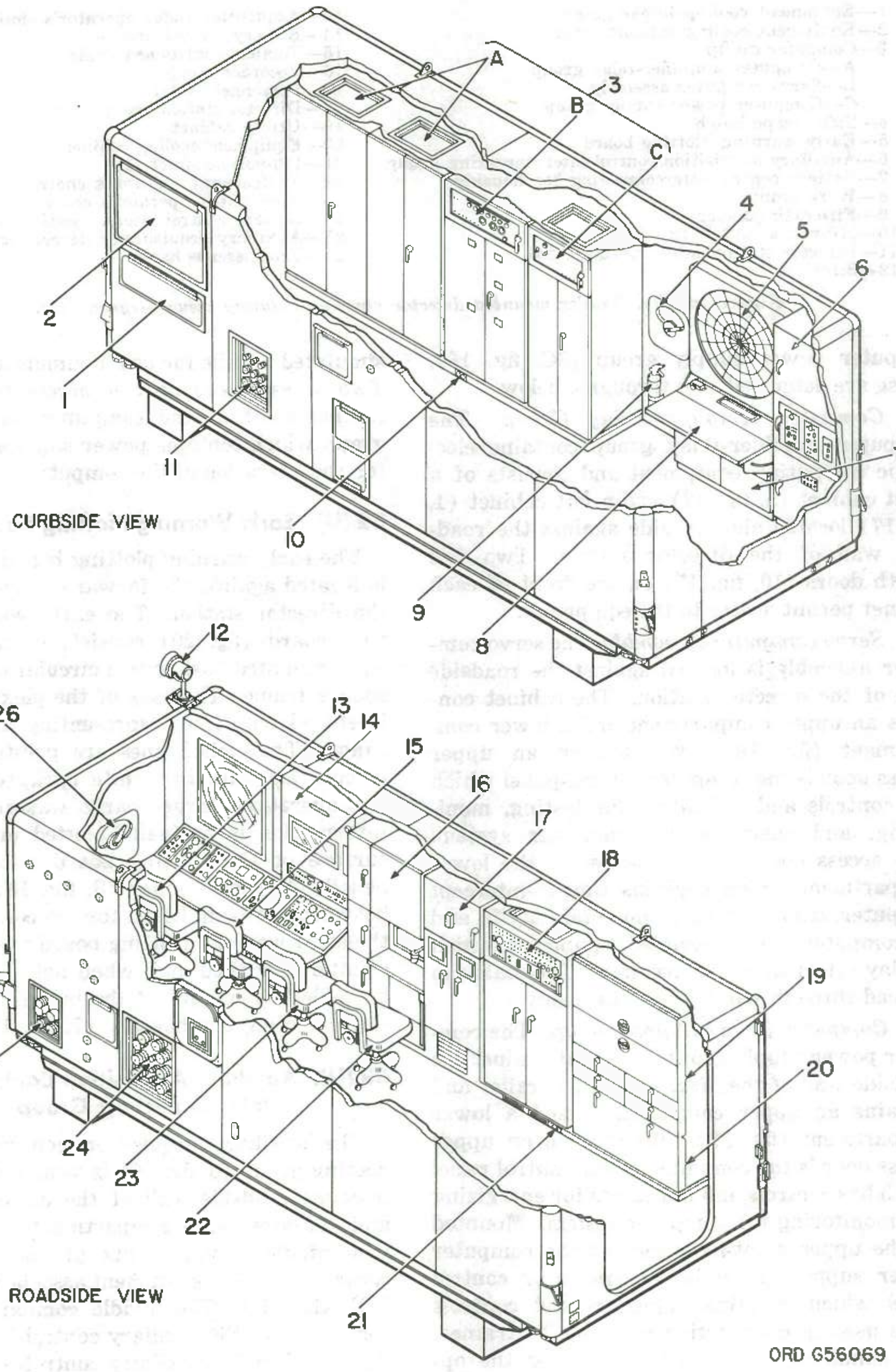


Figure 16 (U). Trailer mounted director station—cutaway views (U).

1—Equipment cooling intake cover
2—Equipment cooling exhaust cover
3—Computer group
A—Computer amplifier-relay group
B—Servo computer assembly
C—Computer power supply group
4—Side escape hatch
5—Early warning plotting board
6—Auxiliary acquisition control interconnecting group
7—Battery control interconnecting box housing
8—Work counter
9—Fire extinguisher
10—110-volt ac outlet (2)
11—Director station interconnecting box
12—Siren
13—Acquisition radar operator's chair
14—Battery control console
15—Tactical controller's chair
16—Recorder group
17—Personnel heater
18—Director station group
19—Utility cabinet
20—Equipment cooling cabinet
21—110-volt ac outlet (2)
22—Switchboard operator's chair
23—Fire control operator's chair
24—Battery control interconnecting box
25—Auxiliary acquisition interconnecting box
26—Front escape hatch

Figure 16 (U). Trailer mounted director station—cutaway views—legend (U).

computer power supply group (3C, fig. 16). These are described in *a* through *c* below.

a. Computer Amplifier-Relay Group. The computer amplifier-relay group contains electronic computing equipment and consists of a right cabinet (5, fig. 17) and a left cabinet (1, fig. 17) located side by side against the roadside wall of the director station. Two full length doors (10, fig. 17) on the front of each cabinet permit access to the equipment.

b. Servo Computer Assembly. The servo computer assembly is located against the roadside wall of the director station. The cabinet contains an upper compartment and a lower compartment (fig. 18). Mounted on an upper access door is the computer control-panel which has controls and indicators for testing, monitoring, and operating the computer system. Two access doors provide access to the lower compartment which contains time-to-intercept computer, climb and turn computer, A_G, B, and T_D computer, and associated equipment which display information on five dials. The dials can be read through windows on the doors.

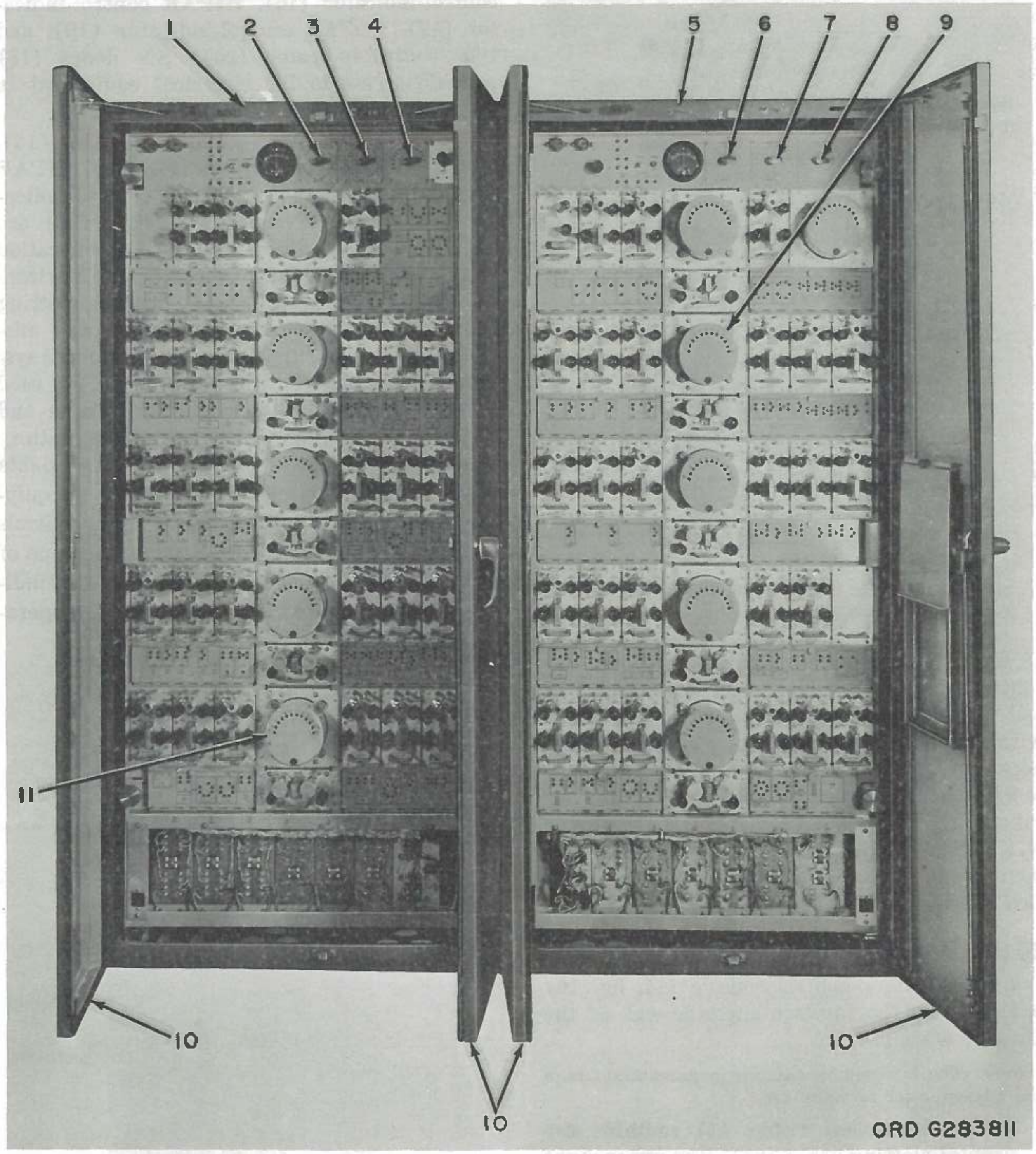
c. Computer Power Supply Group. The computer power supply group is located against the roadside wall of the director station trailer and contains an upper compartment and a lower compartment (fig. 19). Mounted on an upper access door is the computer power control panel which has controls and indicators for energizing and monitoring the computer system. Mounted on the upper right-hand side of the computer power supply group is the simulator control panel which contains indicators and controls to be used in conjunction with the T1 trainer. The simulator control panel provides the operator with the facility for selecting a live or simulated missile for use in simulated missions. Two access doors provide access to the lower compartment of the computer power supply group which contains power supplies necessary for the operation of the computer.

32 (U). Early Warning Plotting Board

The early warning plotting board (5, fig. 16) is located against the forward roadside wall of the director station. The early warning plotting board (fig. 20) consists of a plexiglass sheet mounted flush with a circular opening in a square frame. The back of the plexiglass sheet is etched with lines representing azimuth and range. The etched lines are printed in black to contrast with the white background. During operation, target early warning position information is manually plotted on the front surface of the plotting board with a grease pencil. A work counter (8, fig. 16) is located below the plotting board for the convenience of the early warning plotting board operator. The counter is hinged and, when not required, can be folded down against the battery control interconnecting box housing (7, fig. 16).

33 (U). Auxiliary Acquisition Control Interconnecting Group

The auxiliary acquisition control interconnecting group (6, fig. 16) is located against the forward roadside wall of the director station and contains three compartments. The upper and middle compartments (1 and 2, fig. 21) contain electrical equipment associated with the LOPAR AJD. The middle compartment also contains the IFF auxiliary control-indicator (3, fig. 21), LOPAR auxiliary control-indicator (4, fig. 21), and HIPAR auxiliary control-indicator



1—Left cabinet
2—GROUP 1—GROUP 2 zero check switch
3—GROUP 3—GROUP 4 zero check switch
4—GROUP 5 zero check switch
5—Right cabinet
6—GROUP 6—GROUP 7 zero check switch
7—GROUP 8—GROUP 9 zero check switch
8—GROUP 10 zero check switch
9—Zero set switch (typical)
10—Doors (4)
11—Zero set switch (typical)

Figure 17 (U). Computer amplifier-relay group—doors open (U).

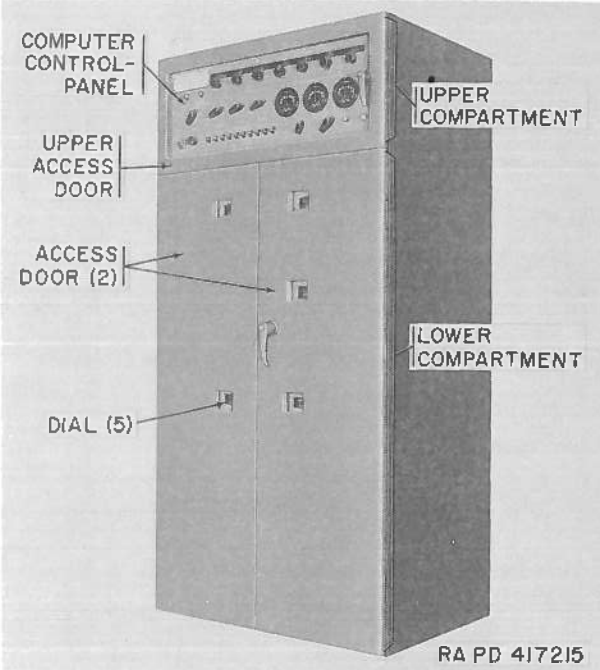


Figure 18 (U). Servo computer assembly—oblique view (U).

(6, fig. 21). The lower compartment (5, fig. 21) contains the FUIF fixed attenuator and PPI test panel. Additional equipment contained within the cabinet consists of circuits for connecting FUIF equipment to the acquisition system, equipment for testing the PPI, circuits for connecting the HIPAR/AAR to the Improved NIKE–HERCULES System, and controls and meters for energizing and monitoring the LOPAR system.

34 (U). Battery Control Console

a. The battery control console (14, fig. 16) is located on the forward curbside wall of the director station.

Note. The key numbers shown in parentheses in *b* and *c* below refer to figure 22.

b. The upper left frame (1) contains the horizontal plotting board (21). The upper right frame (6) contains the altitude plotting board (8), battery signal panel-indicator (10), equipment status indicator lights (4), and an audio alarm speaker (5). On an inclined surface below the upper frames are the tactical control-indicator (11), plan position indicator (PPI) (13), precision indicator (15), target designate control-indicator (16), HIPAR control-indicator (17), LOPAR control-indicator (19), and IFF control-indicator (20). Six doors (18) provide access to the electrical equipment in the lower part of the console.

c. The PPI (13), precision indicator (15), target designate control-indicator (16), HIPAR control-indicator (17), LOPAR control-indicator (19), and IFF control-indicator (20) are all associated with and used in the operation of the acquisition radar systems. The horizontal plotting board (21) and altitude plotting board (8) automatically plot target and missile position data supplied by the computer system. The tactical control-indicator (11) is used in the operation of the computer system and the trailer lighting equipment. The battery signal panel-indicator (10) contains lights which indicate the mission status of the equipment during operation. It also contains controls for selection of the type of mission and type of missile to be used. The equipment status indicator lights (4) are used to indicate the opera-

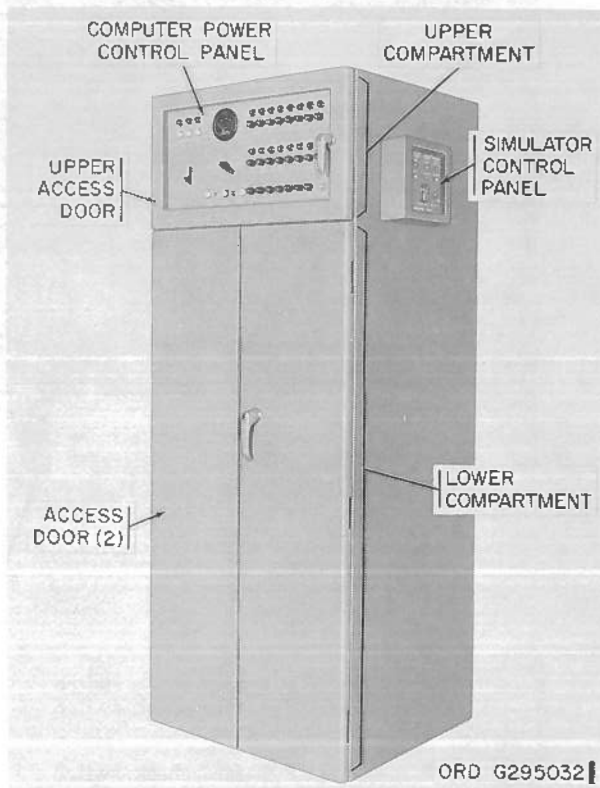


Figure 19 (U). Computer power supply group—oblique view (U).

tional status of the RCDC. The audio alarm speaker (5) is not used.

d. During an engagement, the acquisition radar operator, the tactical controller, and the fire control operator are seated in the acquisition radar operator's chair (13, fig. 16), the tactical controller's chair (15, fig. 16), and the fire control operator's chair (23, fig. 16), respectively. Each operator is positioned before the equipment that he is required to operate

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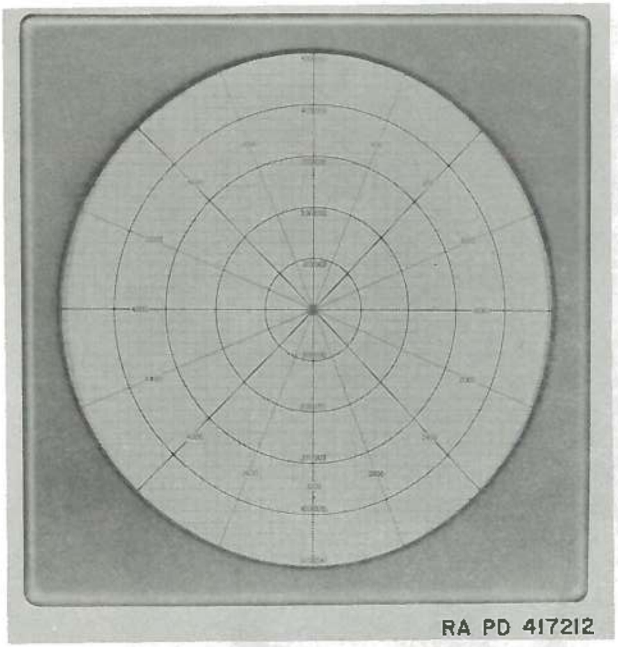


Figure 20 (U). Early warning plotting board—front view (U).

and monitor. The battery control officer normally serves as the tactical controller.

35 (U). Recorder Group

Note. **The key numbers shown in parentheses in this paragraph refer to figure 23 unless otherwise indicated.**

The recorder group (16, fig. 16), located against the curbside wall of the director station, contains four compartments (1, 5, 9, and 10) and a switchboard group (8). The upper right compartment (5) contains the multichannel data recorder (6). The top section of the upper left compartment (1) provides storage for a spare takeup drum (2) and spare supply drum (3) used with the multichannel data recorder. The bottom section of the upper left compartment contains the meter and channel control-indicator (4) on a sliding frame. The middle compartment (10) contains electrical equipment and special tools associated with the

1—Upper compartment
2—Middle compartment
3—IFF auxiliary control-indicator
4—LOPAR auxiliary control-indicator
5—Lower compartment
6—HIPAR auxiliary control-indicator

Figure 21 (U). Auxiliary acquisition control interconnecting group—front view—legend (U).

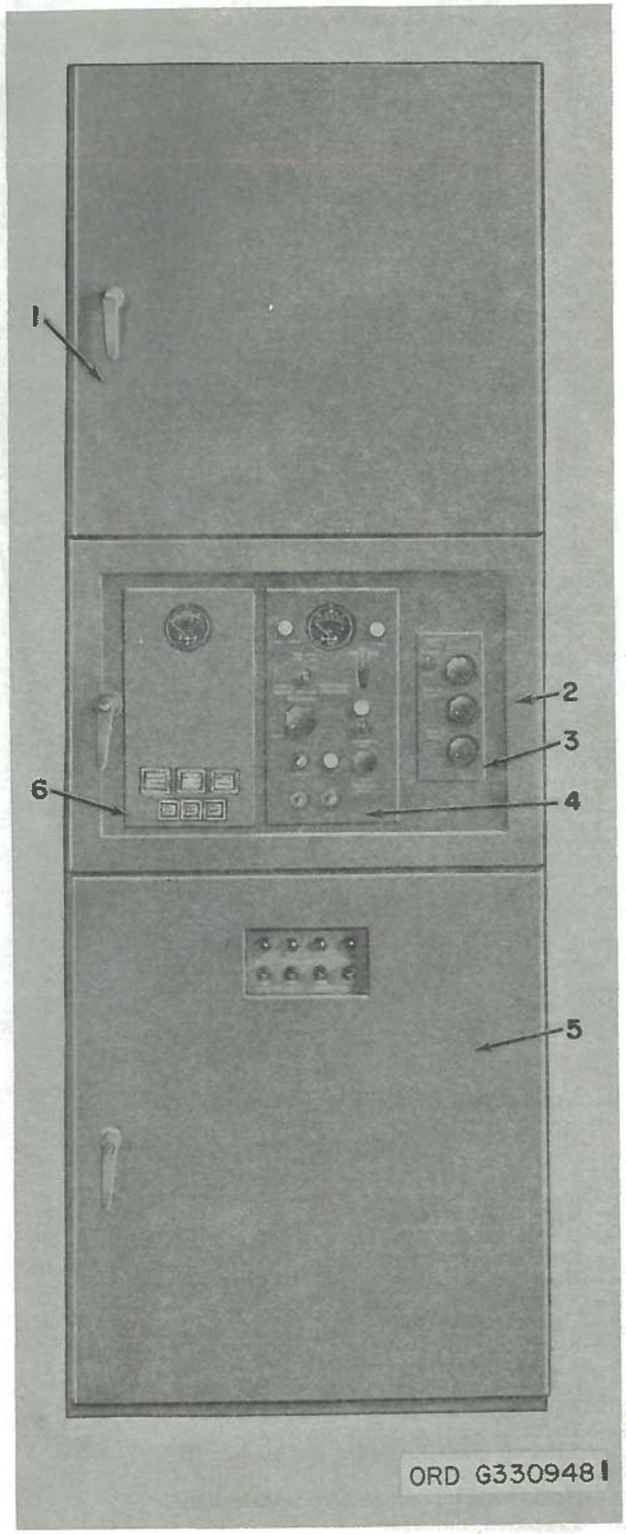
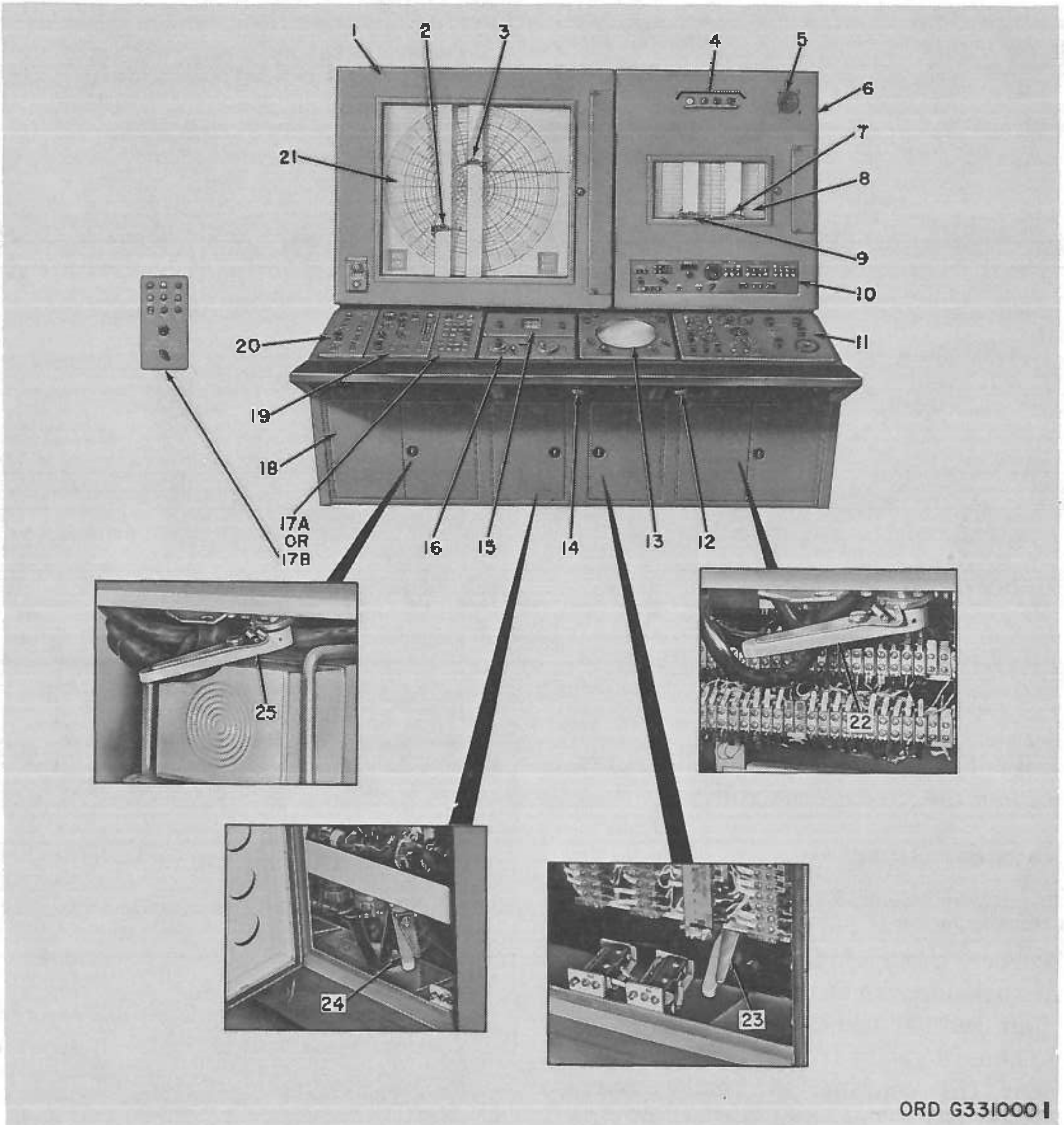


Figure 21 (U). Auxiliary acquisition control interconnecting group—front view (U).



1—Upper left frame
2—Left recorder pen
3—Right recorder pen
4—Equipment status indicator lights
5—Audio alarm speaker
6—Upper right frame
7—Right recorder pen
8—Altitude plotting board
9—Left recorder pen
10—Battery signal panel-indicator
11—Tactical control-indicator
12—Altitude plotting board release handle
13—PPI
14—Horizontal plotting board release handle
15—Precision indicator
16—Target designate control-indicator
17A—HIPAR control-indicator
17B—AAR control-indicator
18—Door (6)
19—LOPAR control-indicator
20—IFF control-indicator
21—Horizontal plotting board
22—Release handle [1] (tactical control-indicator)
23—Release handle (PPI)
24—Release handle (target designate control-indicator)
25—Release handle (HIPAR or AAR control-indicator, LOPAR control-indicator, and IFF control-indicator)

[1] The release handle for the precision indicator is located behind the target designate control-indicator.

Figure 22 (U). Battery control console—front view (U).

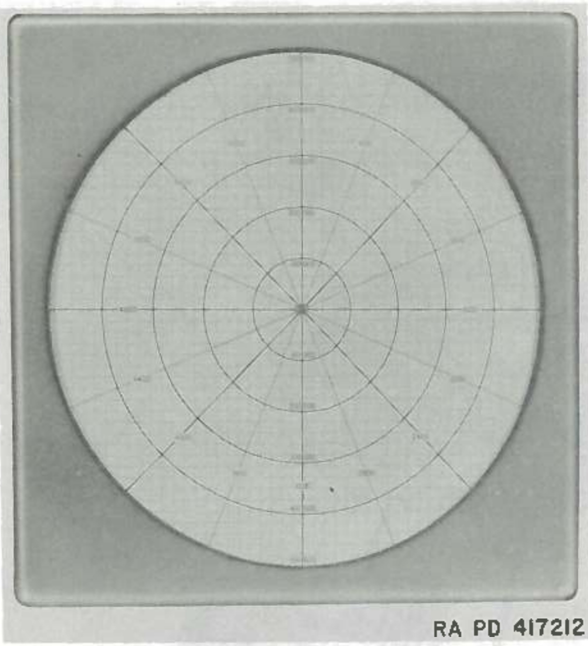


Figure 20 (U). Early warning plotting board—front view (U).

and monitor. The battery control officer normally serves as the tactical controller.

35 (U). Recorder Group

Note. The key numbers shown in parentheses in this paragraph refer to figure 23 unless otherwise indicated.

The recorder group (16, fig. 16), located against the curbside wall of the director station, contains four compartments (1, 5, 9, and 10) and a switchboard group (8). The upper right compartment (5) contains the multichannel data recorder (6). The top section of the upper left compartment (1) provides storage for a spare takeup drum (2) and spare supply drum (3) used with the multichannel data recorder. The bottom section of the upper left compartment contains the meter and channel control-indicator (4) on a sliding frame. The middle compartment (10) contains electrical equipment and special tools associated with the

1—Upper compartment
2—Middle compartment
3—IFF auxiliary control-indicator
4—LOPAR auxiliary control-indicator
5—Lower compartment
6—HIPAR auxiliary control-indicator

Figure 21 (U). Auxiliary acquisition control interconnecting group—front view—legend (U).

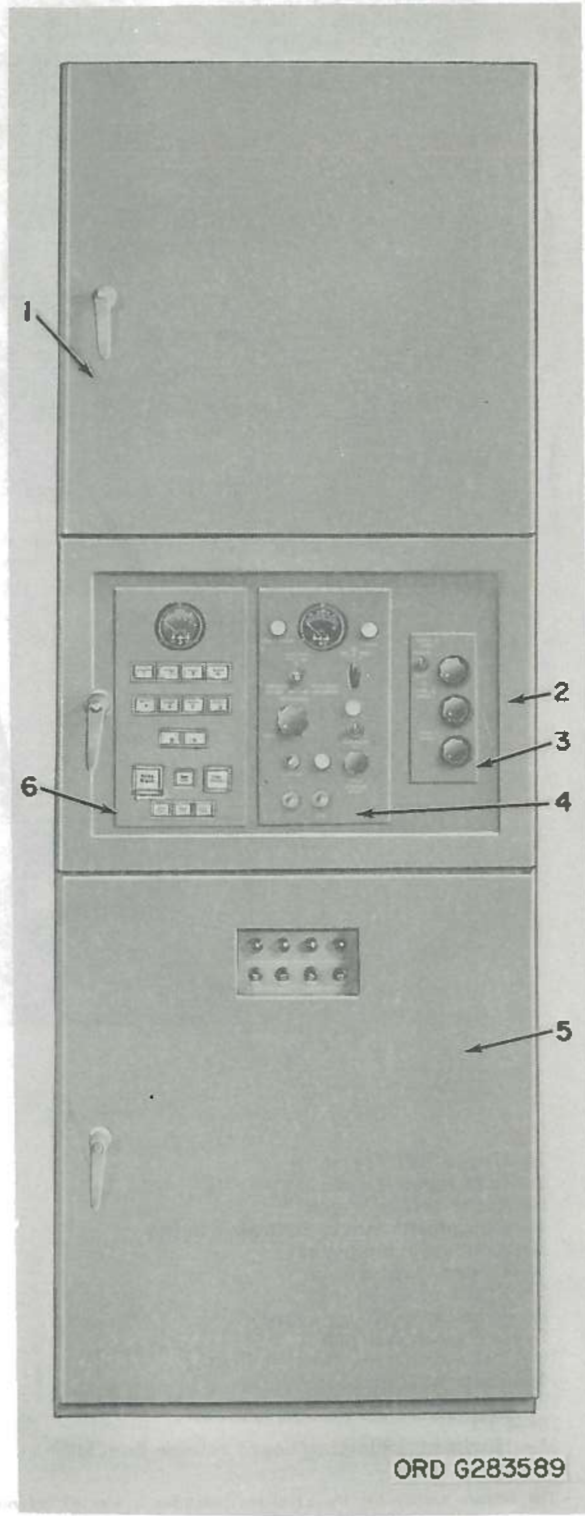
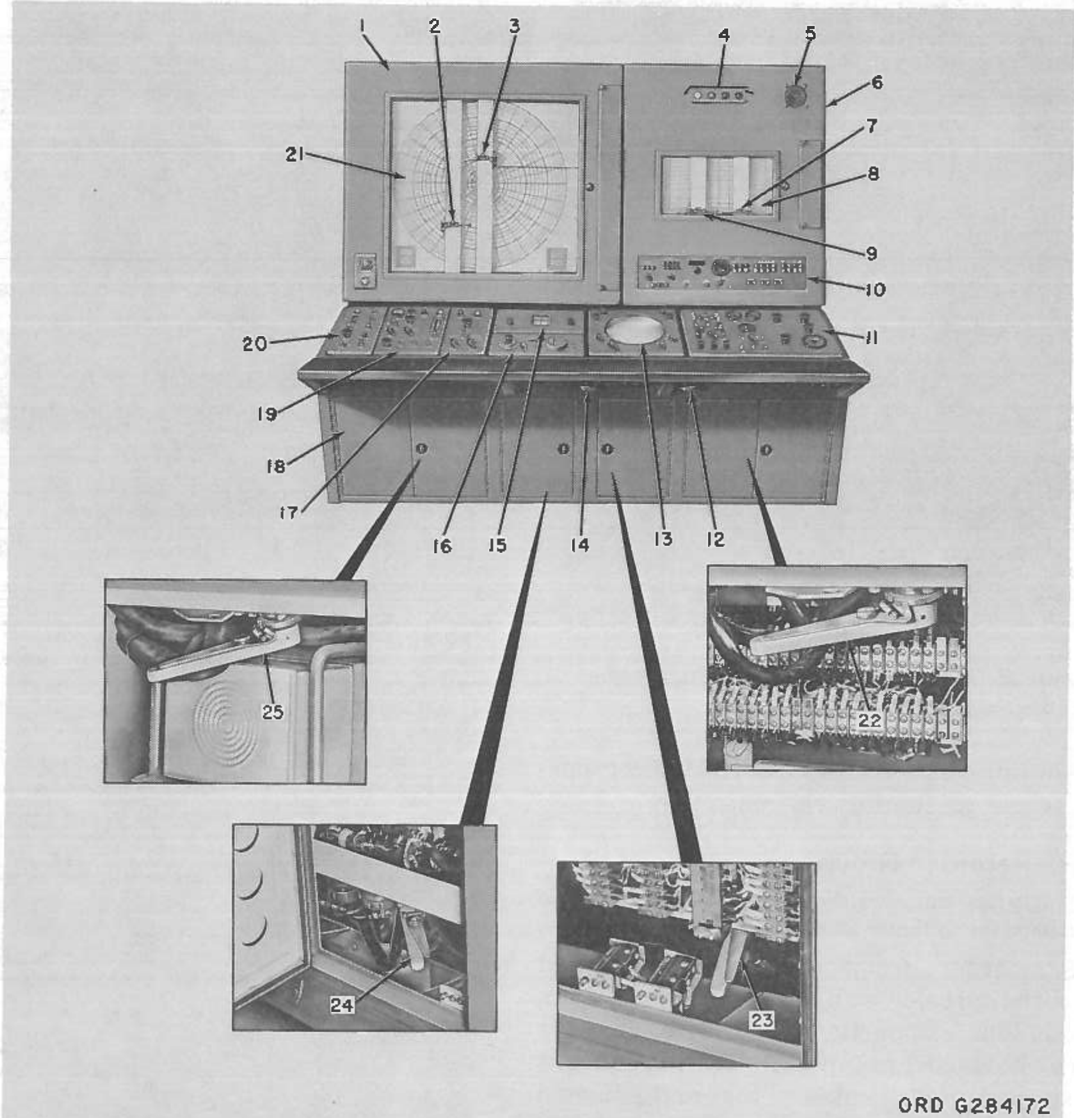


Figure 21 (U). Auxiliary acquisition control interconnecting group—front view (U).



1—Upper left frame
2—Left recorder pen
3—Right recorder pen
4—Equipment status indicator lights
5—Audio alarm speaker
6—Upper right frame
7—Right recorder pen
8—Altitude plotting board
9—Left recorder pen
10—Battery signal panel-indicator
11—Tactical control-indicator
12—Altitude plotting board release handle
13—PPI
14—Horizontal plotting board release handle
15—Precision indicator
16—Target designate control-indicator
17—HIPAR control-indicator
18—Door (6)
19—LOPAR control-indicator
20—IFF control-indicator
21—Horizontal plotting board
22—Release handle [1] (tactical control-indicator)
23—Release handle (PPI)
24—Release handle (Target designate control-indicator)
25—Release handle (HIPAR control-indicator, LOPAR control-indicator, and IFF control-indicator)

[1] The release handle for the precision indicator is located behind the target designate control-indicator.

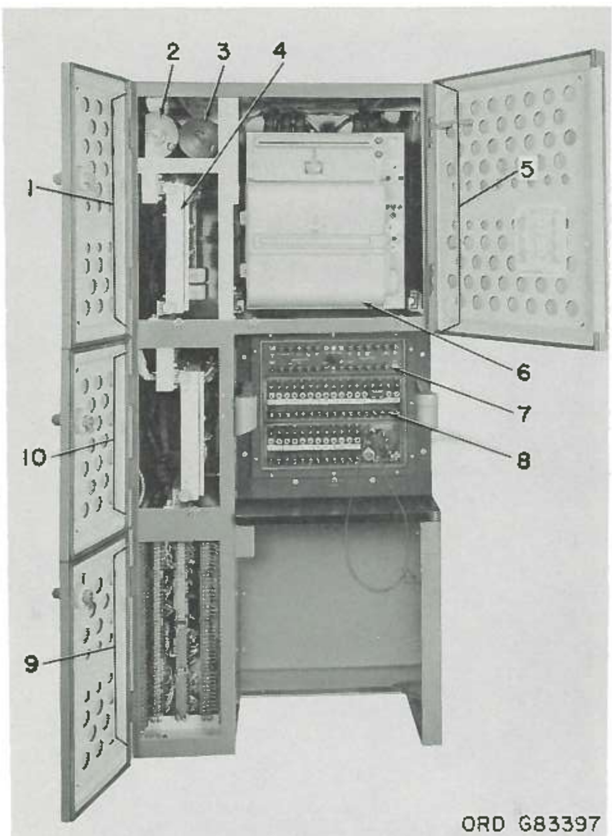
Figure 22 (U). Battery control console—front view (U).

multichannel data recorder and the switchboard group (8). The switchboard group includes the fuse and control panel (7) and switchboard equipment for the voice communication system.

36 (U). Personnel Heater

Note. The key numbers shown in parentheses in this paragraph refer to figure 24 unless otherwise indicated.

The personnel heater (17, fig. 16), located against the curbside wall of the director station, contains an upper utility compartment (2) and two lower compartments (7 and 8). A thermostat (1) on the front of the upper compartment door automatically controls operation of the personnel heater to maintain the desired temperature within the director station. A centrifugal fan (4) provides air circulation. The heater assembly control (10), located behind a cutout in the lower left compartment door, provides controls and indicators for operation of the gasoline burner (9) and associated equipment. The battery indicator panel (5), used for monitoring the batteries and for operating the battery charger, is located behind a cutout in the lower right compartment door. Two 12-volt storage batteries (6) provide 24-volt power for emergency operation of the centrifugal fan and ceiling lights.



1—Upper left compartment
2—Takeup drum (spare)
3—Supply drum (spare)
4—Meter and channel control-indicator
5—Upper right compartment
6—Multichannel data recorder
7—Fuse and control panel
8—Switchboard group
9—Lower compartment
10—Middle compartment

Figure 23 (U). Recorder group—front view—doors open (U).

37 (U). Director Station Group

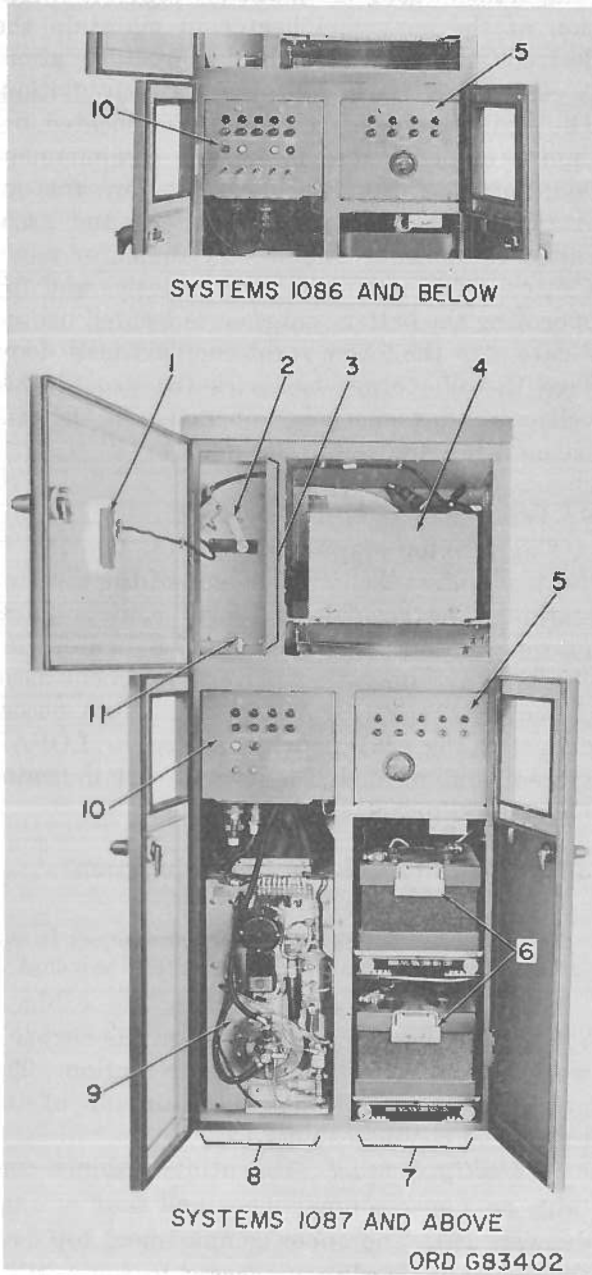
The director station group (18, fig. 16) is located against the curbside wall of the director station. The acquisition power control panel (1, fig. 25) contains controls and indicators for checking and operating power equipment associated with the LOPAR system. Two access doors (2, fig. 25) provide access to LOPAR system equipment and moving target indicator (MTI) equipment.

38 (U). Utility Cabinet and Equipment Cooling Cabinet

Note. The key numbers shown in parentheses in this paragraph refer to figure 26 unless otherwise indicated.

The utility and equipment cooling cabinets (19 and 20, fig. 16) are located on the curbside wall at the rear of the director station. The utility cabinet (3) is mounted on top of the equipment cooling cabinet (4).

a. Utility Cabinet. The utility cabinet contains an upper compartment and four storage drawers (9). The upper compartment top door (1) opens upwardly for access to four utility drawers (15) and storage space for logbook sheets (2). The utility and storage drawers provide storage space for cleaning equipment, plotting board paper, multichannel data recorder paper, and plotting board pen-filler kits. The upper compartment bottom door (10) opens downwardly to form a work counter and to give access to storage space and to a warning panel (14) associated with the equipment cooling system.



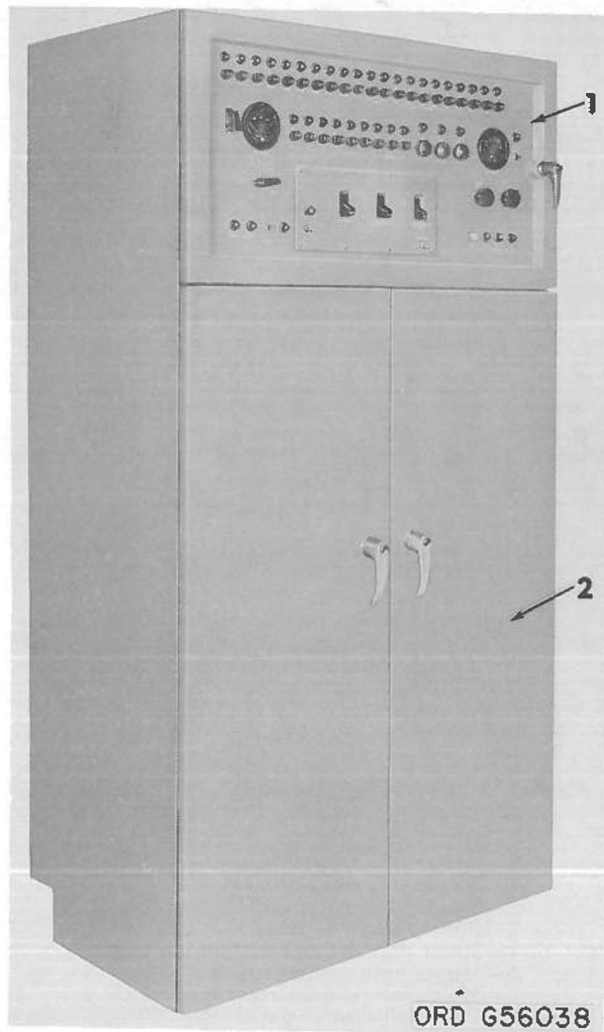
1—Thermostat
2—Upper utility compartment
3—Blower discharge damper control
4—Centrifugal fan
5—Battery indicator panel
6—Battery (2)
7—Lower right compartment
8—Lower left compartment
9—Gasoline burner
10—Heater assembly control
11—Blower intake damper control

Figure 24 (U). Personnel heater—front view—doors open (U).

b. Equipment Cooling Cabinet. The equipment cooling cabinet contains a single compartment with a removable access door (6). The compartment contains the two equipment cooling fans (5), equipment cooling fan motor (8), and video decoder sliding frame (7). The fans provide air cooling of the electronic equipment within the various cabinets and consoles throughout the director station.

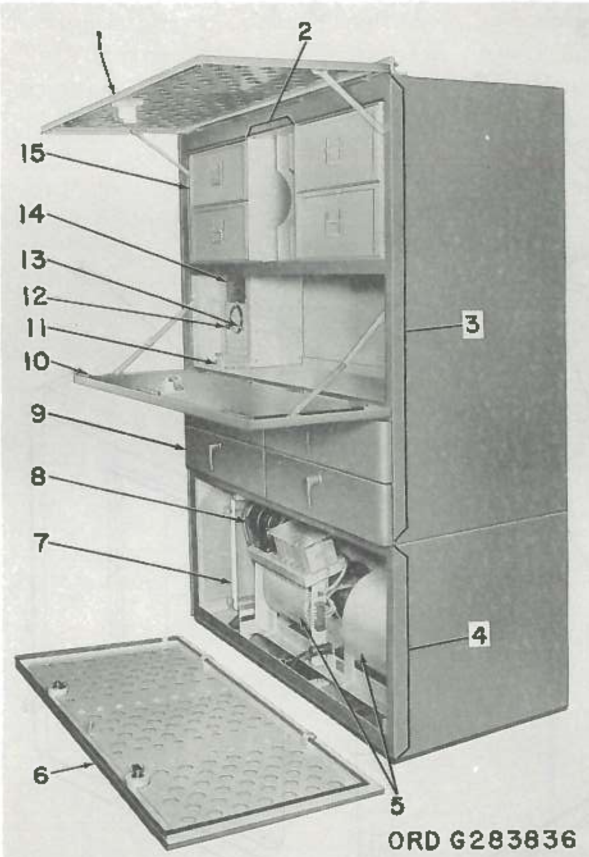
39 (U). Trailer Lighting Equipment

The director station is lighted internally by 18 incandescent lights in 10 incandescent light fixtures, and 6 blacklight lights in 6 blacklight



1—Acquisition power control panel
2—Access door (2)

Figure 25 (U). Director station group—oblique view (U).



1—Upper compartment top door
2—Storage space for logbook sheets
3—Utility cabinet
4—Equipment cooling cabinet
5—Equipment cooling fan (2)
6—Access door
7—Video decoder sliding frame
8—Equipment cooling fan motor
9—Storage drawer (4)
10—Upper compartment bottom door
11—Damper and shutter lever
12—System overheated indicator light
13—Alarm buzzer silence switch
14—Warning panel
15—Utility drawer (4)

Figure 26 (U). Utility cabinet and equipment cooling cabinet—oblique view—doors open (U).

light fixtures. The light fixtures are installed in the ceiling of the director station.

Note. The key numbers shown in parentheses in *a* and *b* below refer to figure 27.

a. Incandescent Lights. Eight incandescent light fixtures (3 and 4) are mounted in a row and evenly spaced from front to rear of the director station. Each of two of these eight incandescent light fixtures (4) contains one white incandescent light for normal operation, and one white incandescent emergency light that operates on 24-volt battery power when normal power is not available. Each of six of the eight incandescent light fixtures (3) contains one white incandescent light and one blue blackout light. Each of two early warning plotting board incandescent light fixtures (1) contains one white incandescent light.

b. Blacklight Light. Each of six blacklight light fixtures (2) contains a blacklight (ultraviolet) light which causes the fluorescent-painted panel markings on the cabinets and consoles to glow so that markings are visible when the white incandescent lights are not illuminated.

40 (U). Miscellaneous Equipment

Miscellaneous equipment of the director station is described in *a* through *j* below.

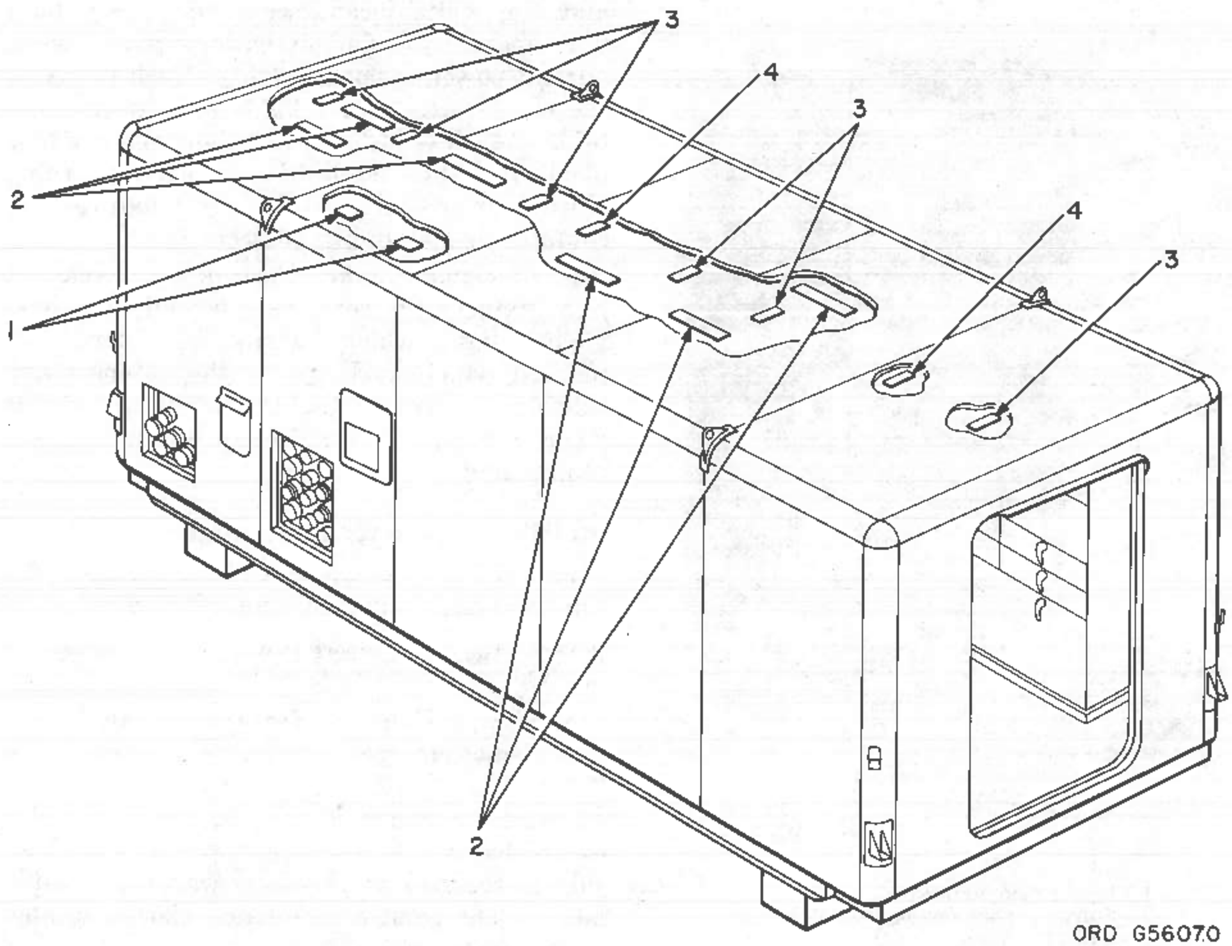
Note. The key numbers shown in parentheses in *a* through *j* below refer to figure 16.

a. Escape Hatches. Two escape hatches are provided as emergency exits. Each escape hatch has a door which opens outwardly to provide an opening about 2 feet square. The side escape hatch (4) is located in the roadside wall just to the rear of the early warning plotting board. The front escape hatch (26) is located in the front wall.

b. Fire Extinguisher. A fire extinguisher (9) is mounted on the roadside wall below the side escape hatch. A second fire extinguisher is supplied mounted on the entrance door, but is normally removed and mounted in the adjoining building when the entrance door is removed for a fixed CONUS emplacement.

c. AC Outlets. Six 110-volt ac outlets are provided in the director station. Two 110-volt ac outlets (10) are located at the base of the servo computer assembly; two 110-volt ac outlets (21) are located at the base of the director station group; and two 110-volt ac outlets are located at the base of the battery control console (14).

d. Chairs. Four armless, caster-mounted, swivel chairs are provided for personnel in the director station. The acquisition radar operator's chair (13), the tactical controller's chair (15), and the fire control operator's chair (23)



1—Early warning plotting board incandescent light fixture (2)
2—Blacklight light fixture (6)
3—Incandescent light fixture (6)
4—Incandescent light fixture (2)

Figure 27 (U). Trailer mounted director station—lighting equipment (U).

are positioned in front of the battery control console (14). The switchboard operator's chair (22) is positioned in front of the recorder group (16).

e. Blackout Curtains. Two blackout curtains are provided at the entrance of the director station and are slide-mounted in the ceiling. The bottom of the curtains can be secured to the floor when the curtains are extended. When not in use, one curtain is stored between the director station group (18) and the utility cabinet (19). The other curtain is stored between the computer amplifier-relay group (3A) and the rear wall of the director station.

f. Siren. A siren (12) is mounted on the top at the rear of the director station trailer. The siren is used to alert personnel in the area when an attack is imminent.

g. Director Station Interconnecting Box. The director station interconnecting box (11), located on the external curbside wall, is used for connecting cables to the director station from the LOPAR antenna-receiver-transmitter group, trailer mounted tracking station, and power source.

h. Auxiliary Acquisition Interconnecting Box. The auxiliary acquisition interconnecting box (25), located on the external roadside wall, is used for connecting cables to the director station from the HIPAR building or AAR equipment and the FUIF equipment.

i. Battery Control Interconnecting Box. The battery control interconnecting box (24), located on the external roadside wall, is used for connecting cables to the director station from the trailer mounted tracking station, target track antenna-receiver-transmitter group, and missile track antenna-receiver-transmitter group, and from the trailer mounted launching control station in the launching area.

j. Equipment Cooling Vents. The intake and exhaust vents of the equipment cooling system are protected by the equipment cooling intake cover (1) and exhaust cover (2). The covers are hinged at the top and are held open by props during operation.

41 (U). Radar Bomb Scoring Equipment

When the RCDC is used for radar bomb scoring (RBS) missions, two pieces of Air Force equipment are temporarily installed in the trailer mounted director station. One piece of equipment, the RBS scale factor box, is installed in the computer group and is not visible to operating personnel during RBS missions. The other piece of equipment, the RBS control unit, is connected to the battery control console. This equipment is Air Force responsibility and is connected to the Improved NIKE–HERCULES System during RBS missions only.

Section III (U). PHYSICAL DESCRIPTION OF THE TRAILER MOUNTED TRACKING STATION

42 (U). General

a. In a fixed CONUS site, the trailer mounted tracking station is joined either to the electronic shop building, as shown in figure 13, or to the HIPAR building, as shown in figure 14. In either configuration, the entrance door at the rear of the trailer is removed, and access to the trailer is through the adjoining building. The undercarriage of the trailer is also removed and the trailer is supported on blocks or beams.

Note. The key numbers shown in parentheses in *b* below refer to figure 28.

b. Major components of the tracking station are the target ranging radar control (2), missile radar control console (3), radar set group (5), target radar control console (9), personnel heater (11), radar power supply group (13), radar coder set (15), utility cabinet (16), and equipment cooling cabinet (17). These components are described in paragraphs 43 through 50. Trailer lighting equipment is described in paragraph 51, and miscellaneous equipment is described in paragraph 52.

43 (U). Target Ranging Radar Control

The target ranging radar control (2, fig. 28) is located against the roadside wall of the tracking station. The upper section (2, fig. 29) contains the range radar power control-indicator (1, fig. 29), which provides controls and indicators for operation and test of the TRR system. Two access doors (4, fig. 29) provide access to the lower section (3, fig. 29), which contains a test scope, target test IF signal generator, power equipment, and associated circuits for the TRR system.

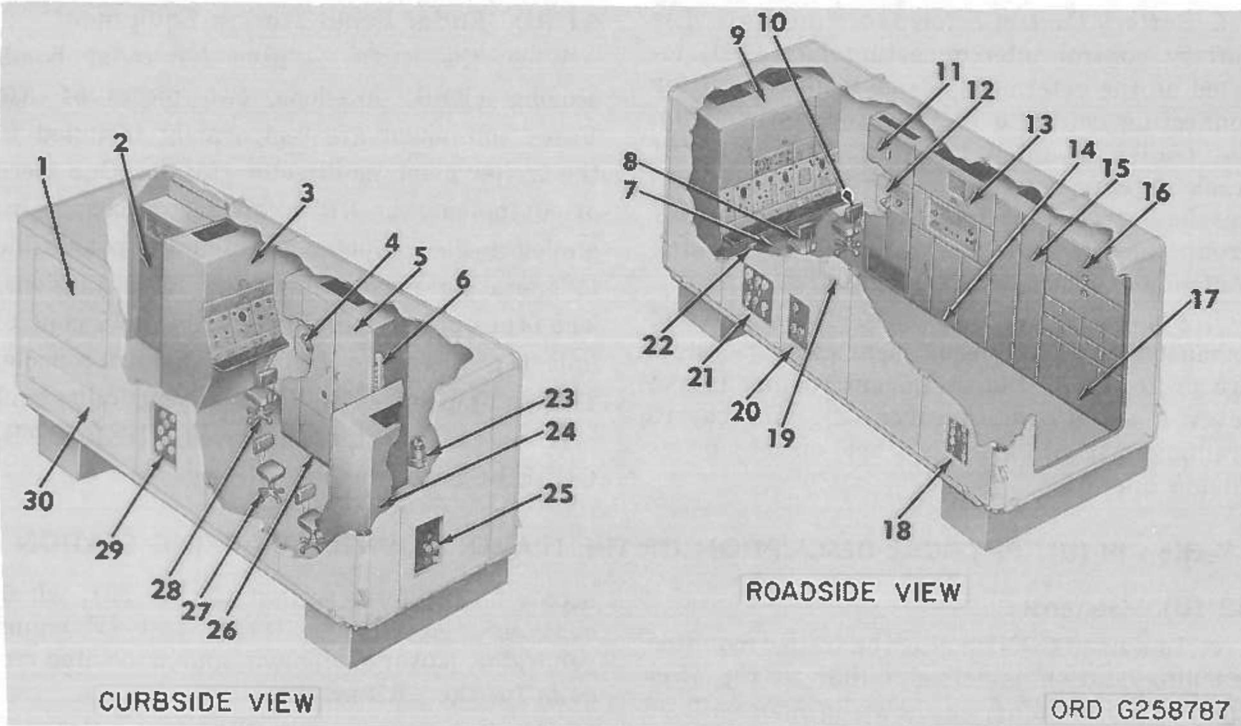
44 (U). Missile Radar Control Console

a. The missile radar control console (3, fig. 28) is located with the right side of the console against the roadside wall of the tracking station.

Note. The key numbers shown in parentheses in *b* through *d* below refer to figure 30.

b. The upper section (2) of the console contains the missile control-indicator group (12) which provides controls and indicators used in operation of the MTR system and indicator lights associated with the tactical control system. The access door (1) above the missile control-indicator group opens upwardly to provide access to electrical and electronic equipment necessary for the coding of orders to be transmitted to a NIKE–AJAX missile.

c. The middle section (3) contains the missile track indicator (11), range indicator (10), missile track control power supply (7), and missile track control drawer (9). The missile track indicator contains meters and dials associated with the antenna system of the MTR system, and controls and indicator lights for launcher selection. The range indicator displays missile tracking data. The front panel of the missile track control power supply contains controls and indicators used in operation of



1—Equipment cooling intake cover
2—Target ranging radar control
3—Missile radar control console
4—Roadside escape hatch
5—Radar set group
6—Remote transmitter control
7—110-volt ac outlet (2)
8—Target azimuth operator's chair
9—Target radar control console
10—Target range operator's chair
11—Personnel heater
12—Curbside escape hatch
13—Radar power supply group
14—110-volt ac outlet (2)
15—Radar coder set
16—Utility cabinet
17—Equipment cooling cabinet
18—Target ranging radar control interconnecting box
19—Roadside escape hatch
20—Radar set group rear interconnecting box
21—Radar set group forward interconnecting box
22—Target elevation operator's chair
23—Fire extinguisher
24—Target radar control console
25—Target radar control interconnecting box
26—110-volt ac outlet (2)
27—Tracking supervisor's chair
28—Missile track operator's chair
29—Radar power supply interconnecting box
30—Equipment cooling exhaust cover

Figure 28 (U). Trailer mounted tracking station—cutaway views (U).

the high voltage circuits of the MTR system. The front panel of the missile track control drawer contains controls used in testing and operating the MTR system.

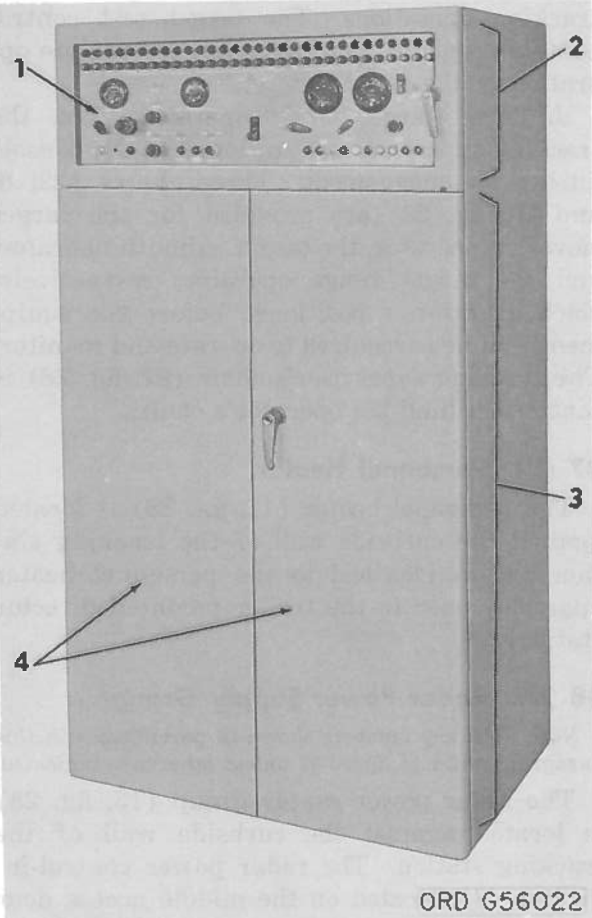
d. A work counter (6) is provided at the top of the lower section (4) for the convenience of the missile track operator. The panel (5) beneath the counter provides access to terminal boards inside the lower section.

e. During an engagement the missile track operator is seated in the missile track operator's chair (28, fig. 28) in front of the console.

45 (U). Radar Set Group

Note. The key numbers shown in parentheses in this paragraph refer to figure 31 unless otherwise indicated.

The radar set group (5, fig. 28) is located against the roadside wall of the tracking station. A remote transmitter control (6, fig. 28) is mounted on the right side of the radar set group. The remote transmitter control contains auxiliary controls for the TRR and TTR systems. A side access door (6) provides access to electrical equipment panels associated with the launcher-selection operation of the MTR system. A left access door (1) and a right access door (2) provide access to electrical electronic equipment associated with the operation of the MTR and TTR systems. The right and left access doors each have a glass covering on the target range dial (4) and on the



1—Range radar power control-indicator
2—Upper section
3—Lower section
4—Access door (2)

Figure 29 (U). Target ranging radar control—oblique view (U).

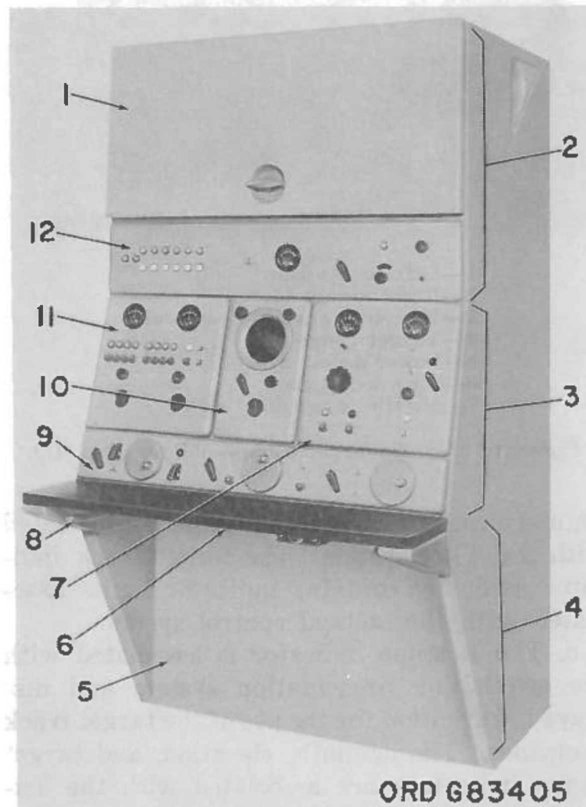
missile range dial (7). A lower access door (5) provides access to terminal strips.

46 (U). Target Radar Control Console

Note. The key numbers shown in parentheses in *a* through *c* below refer to figure 32 unless otherwise indicated.

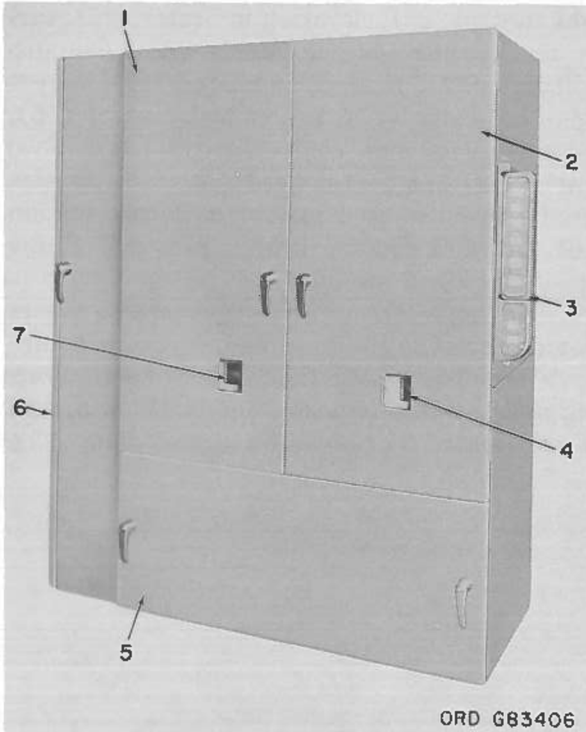
a. The target radar control console (9, fig. 28) is located against the front wall of the tracking station. The upper section (12) of the console contains a left access door (1), center access door (2), right access door (11), countermeasures control-indicator (9), and target track indicator assembly (10). The middle section (13) of the console contains the electric light control (25), elevation indicator (26), target track control-power supply (22), azimuth indicator (21), B scope indicator (19), target range indicator (17), target test control (15), and target antenna control group (24). Two panels (18) can be removed for access to terminal boards located inside the lower section (16). A work counter (20) is provided at the top of the lower section.

b. The left center, and right access doors provide access to electrical and electronic equipment associated with the TTR system. Four equipment status indicator lights (3, 4, 5, and 6) are located on the center access door. The



1—Access door
2—Upper section
3—Middle section
4—Lower section
5—Panel
6—Work counter
7—Missile track control power supply
8—Access handle
9—Missile track control drawer
10—Range indicator
11—Missile track indicator
12—Missile control-indicator group

Figure 30 (U). Missile radar control console—oblique view (U).



1—Left access door
2—Right access door
3—Remote transmitter control
4—Target range dial
5—Lower access door
6—Side access door
7—Missile range dial

Figure 31 (U). Radar set group—oblique view (U).

countermeasures control-indicator is associated with the TRR system. The target track indicator assembly contains indicator lights associated with the tactical control system.

c. The B scope indicator is associated with the acquisition presentation system and displays information for the use of the target track operators. The azimuth, elevation, and target range indicators are associated with the azimuth, elevation, and range presentation circuits, respectively, of the TTR system. The target track control-power supply contains controls and indicators necessary for the operation of power circuits associated with the TTR system. The electric light control contains controls for operation of the tracking station ceiling lights, and dial and signal lights on the target radar control console and locking switches used during a surface-to-surface mission. The target antenna control group contains controls and indicators used in target tracking operations. The target test control contains controls and indicators for remote operation of the radar test set.

d. Three target track operators and the tracking supervisor are stationed at the console during an engagement. Three chairs (22, 8, and 10, fig. 28) are provided for the target elevation operator, the target azimuth operator, and the target range operator, respectively. Each operator is positioned before the equipment that he is required to operate and monitor. The tracking supervisor's chair (27, fig. 28) is centered behind the operator's chairs.

47 (U). Personnel Heater

The personnel heater (11, fig. 28) is located against the curbside wall of the tracking station and is identical to the personnel heater (par. 36) used in the trailer mounted director station.

48 (U). Radar Power Supply Group

Note. The key numbers shown in parentheses in this paragraph refer to figure 33 unless otherwise indicated.

The radar power supply group (13, fig. 28) is located against the curbside wall of the tracking station. The radar power control-indicator (8), located on the middle access door (10) of the center compartment (5), contains controls and indicators for operating and checking power equipment associated with the TTR and MTR systems. The missile and target fuse panel (2), located in the upper compartment (3) behind a cutout in the upper compartment access door (1), contains fuses and blown-fuse indicator lights associated with the power equipment. Power supplies, electrical panels, terminal strips, spare fuses, and other power equipment associated with the TTR and MTR systems, are located inside the upper, center, and lower compartments. Access to the equipment is provided by the upper compartment access door, left access door (9), right access door (4), and three access doors (7) in the lower compartment (6).

49 (U). Radar Coder Set

The radar coder set (15, fig. 28) is located against the curbside wall of the tracking station. The upper half of the radar coder set

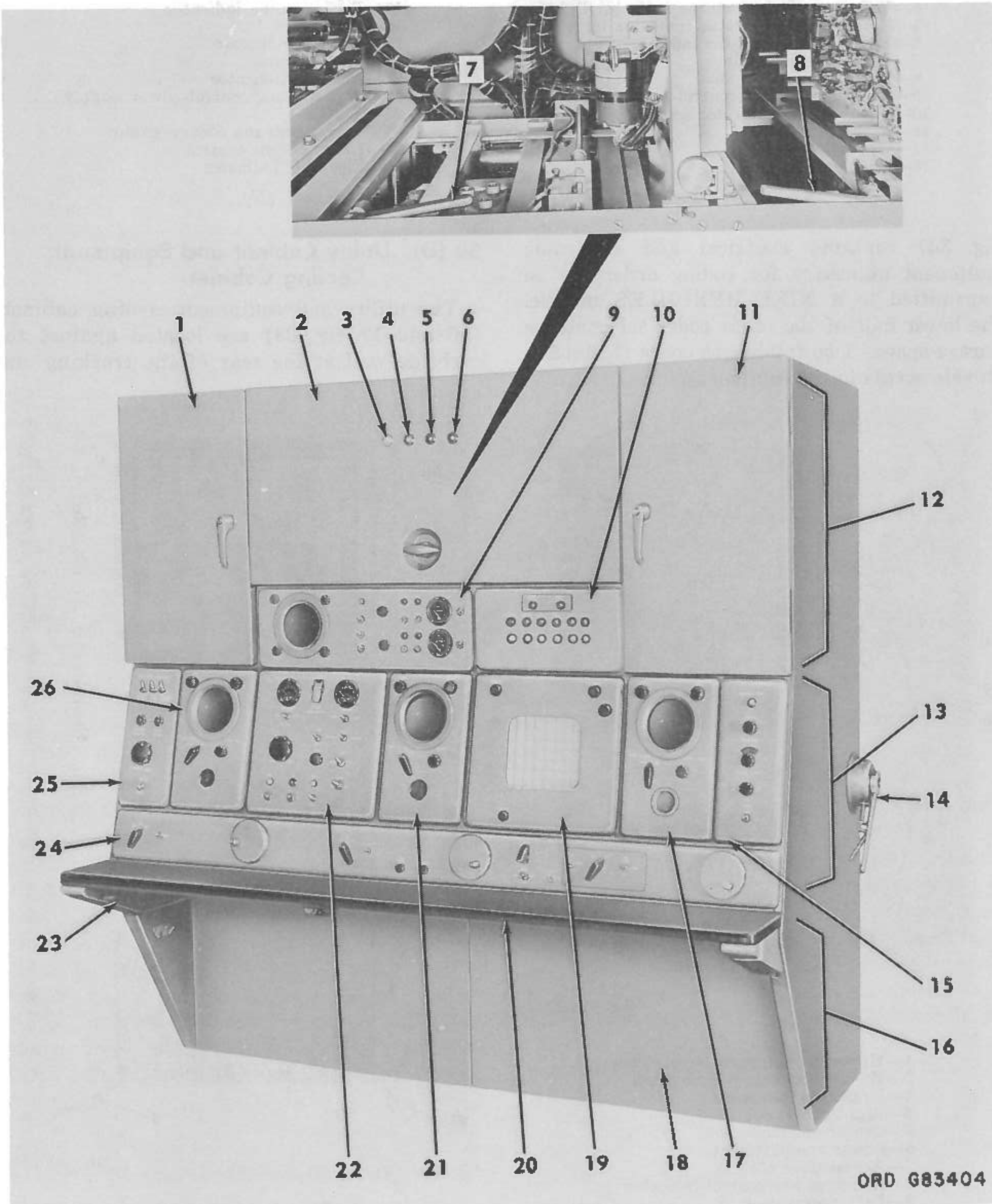
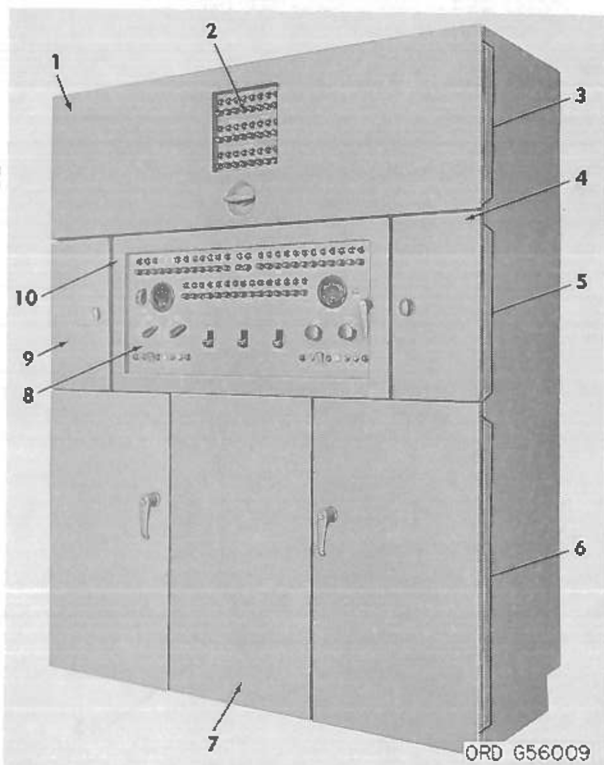


Figure 32 (U). Target radar control console (U).

1—Left access door
2—Center access door
3—White equipment status indicator light
4—Yellow equipment status indicator light
5—Blue equipment status indicator light
6—Red equipment status indicator light
7—Left release handle
8—Right release handle
9—Countermeasures control-indicator
10—Target track indicator assembly
11—Right access door
12—Upper section
13—Middle section
14—Access release handle
15—Target test control
16—Lower section
17—Target range indicator
18—Panel (2)
19—B scope indicator
20—Work counter
21—Azimuth indicator
22—Target track control-power supply
23—Handle
24—Target antenna control group
25—Electric light control
26—Elevation indicator

Figure 32 (U). Target radar control console—legend (U).

(fig. 34) contains electrical and electronic equipment necessary for coding orders to be transmitted to a NIKE-HERCULES missile. The lower half of the radar coder set contains storage space. Two full-length doors (3, fig. 34) provide access to the equipment.

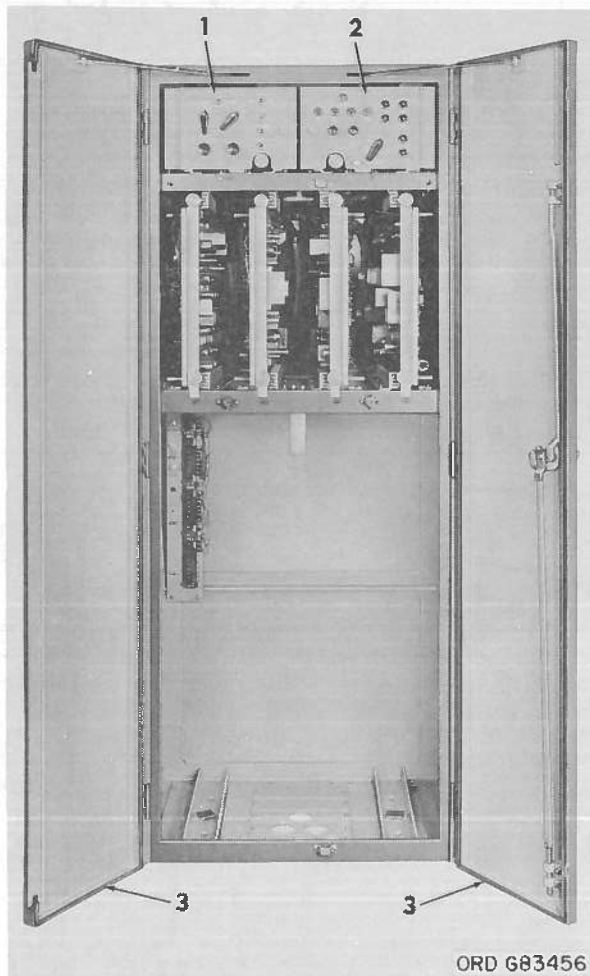


1—Upper compartment access door
2—Missile and target fuse panel
3—Upper compartment
4—Right access door
5—Center compartment
6—Lower compartment
7—Access door (3)
8—Radar power control-indicator
9—Left access door
10—Middle access door

Figure 33 (U). Radar power supply group—oblique view (U).

50 (U). Utility Cabinet and Equipment Cooling Cabinet

The utility and equipment cooling cabinets (16 and 17, fig. 28) are located against the curbside wall at the rear of the tracking sta-



1—Electrical test panel
2—Coder control-indicator
3—Door (2)

Figure 34 (U). Radar coder set—doors open (U).

tion. They are identical to the utility cabinet and equipment cooling cabinet (par. 38) used in the trailer mounted director station. The four storage drawers (9, fig. 26) are used to store tools and spare parts required in the tracking station.

51 (U). Trailer Lighting Equipment

The tracking station is lighted internally by 16 incandescent lights in 8 incandescent light fixtures and 5 blacklight lights in 5 blacklight light fixtures. The light fixtures are installed in the ceiling of the tracking station.

a. Incandescent Lights. Each of two incandescent light fixtures (3, fig. 35) contains one white incandescent light for normal operation and one white incandescent emergency light that operates on 24-volt battery power when normal power is not available. The remaining six incandescent light fixtures (2, fig. 35) contain one white incandescent light and one blue blackout light each.

b. Blacklight Lights. Each of the five blacklight light fixtures (1, fig. 35) contains a blacklight (ultraviolet) light which causes the fluorescent-painted panel markings on the cabinets and consoles to glow, so the markings are visible when the white incandescent lights are not illuminated.

52 (U). Miscellaneous Equipment

Miscellaneous equipment of the tracking station is described in *a* through *k* below.

Note. The key numbers shown in parentheses in *a* through *k* below refer to figure 28.

a. Escape Hatches. Two escape hatches are provided as emergency exits. Each escape hatch has a door which opens outwardly to provide an opening about 2 feet square. The roadside escape hatch (4 or 19) is located in the roadside wall between the missile radar control console (3) and the radar set group (5). The curbside escape hatch (12) is located on the curbside wall between the target radar control console (9) and the personnel heater (11).

b. Fire Extinguisher. A fire extinguisher (23) is mounted on the roadside wall between the radar set group and the target radar control console (24). A second fire extinguisher is mounted on the entrance door but is normally removed and mounted in the adjoining building when the entrance door is removed for a fixed CONUS emplacement.

c. AC Outlets. Six 110-volt ac outlets are provided in the tracking station. Two 110-volt ac outlets (7) are located at the base of the target radar control console; two 110-volt ac outlets (14) are located at the base of the radar power supply group (13); and two 110-volt ac outlets (26) are located at the base of the radar set group.

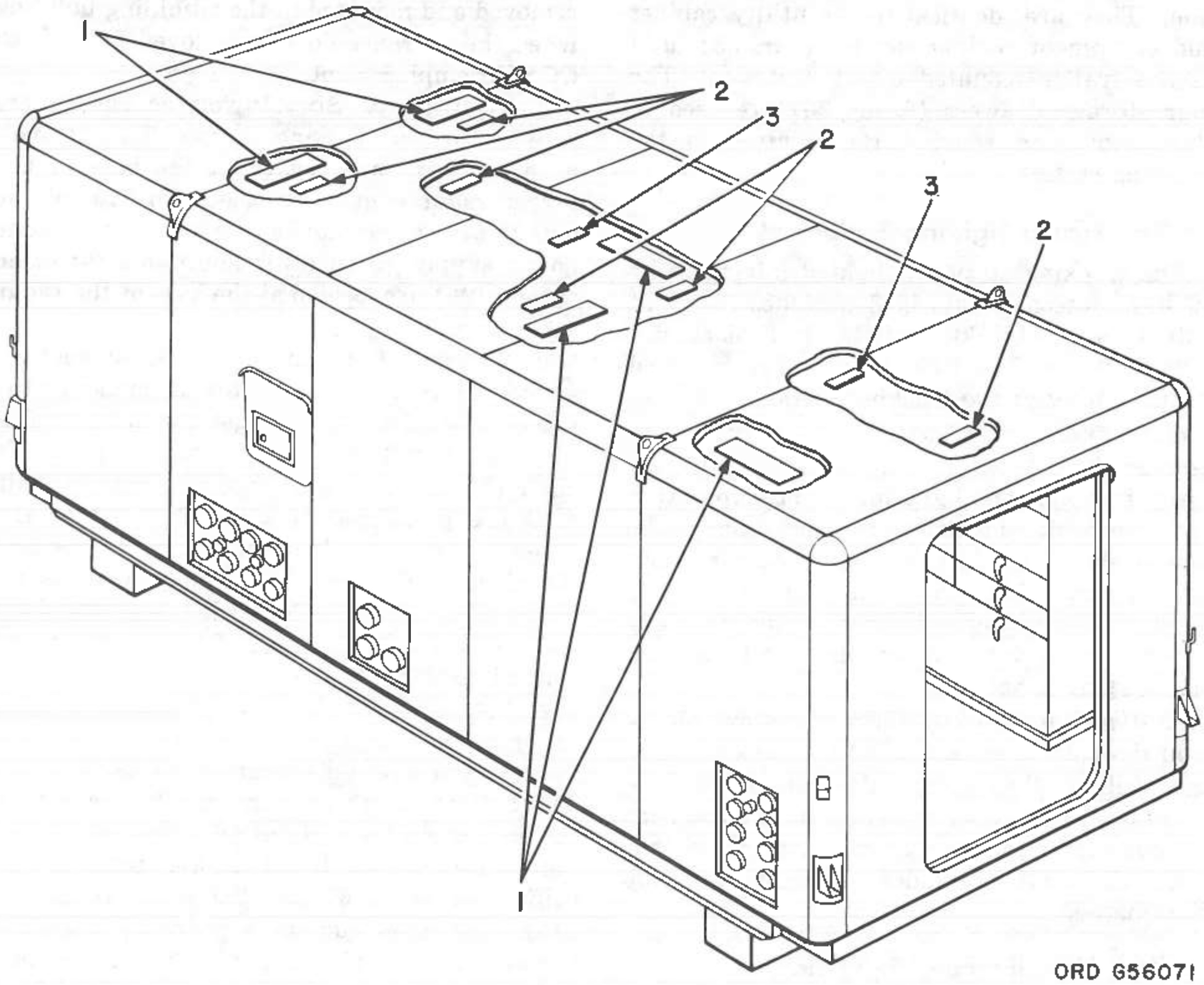
d. Chairs. Five armless, caster-mounted swivel chairs are provided for personnel in the tracking station. The target elevation operator's chair (22), the target azimuth operator's chair (8), and the target range operator's chair (10) are positioned in a line in front of the target radar control console. Centered behind the three chairs is the tracking supervisor's chair (27). The missile track operator's chair (28) is positioned in front of the missile radar control console.

e. Blackout Curtains. Two blackout curtains are provided at the entrance to the tracking station and are slide-mounted in the ceiling. The bottom of the curtains can be secured to the floor when the curtains are extended. When not in use, one curtain is stored between the utility cabinet (16) and the radar coder set (15). The other curtain is stored between the target ranging radar control (2) and the rear wall.

f. Target Ranging Radar Control Interconnecting Box. The target ranging radar control interconnecting box (18), located on the external roadside wall near the rear of the trailer, is used for connecting cables to the tracking station from the power source and from the target range antenna-receiver-transmitter group.

g. Radar Set Group Rear Interconnecting Box. The radar set group rear interconnecting box (20), located on the external roadside wall, is used for connecting cables to the tracking station from the trailer mounted director station.

h. Radar Set Group Forward Interconnecting Box. The radar set group forward interconnecting box (21), located on the external roadside wall, is used for connecting cables to the tracking station from the target track and missile track antenna-receiver-transmitter groups.



1—Blacklight light fixture (5) 2—Incandescent light fixture (6) 3—Incandescent light fixture (2)

Figure 35 (U). Trailer mounted tracking station—lighting equipment (U).

i. Target Radar Control Interconnecting Box. The target radar control interconnecting box (25), located on the external front wall, is used for connecting cables to the tracking station from the trailer mounted director station and from the target track antenna-receiver-transmitter group.

j. Radar Power Supply Interconnecting Box. The radar power supply interconnecting box (29), located on the external curbside wall, is used for connecting cables to the tracking station from the power source, trailer mounted director station, radar test set, and target and missile track antenna-receiver-transmitter groups.

k. Equipment Cooling Vents. The intake and exhaust vents of the equipment cooling system are protected by the equipment cooling intake cover (1) and exhaust cover (30). The covers are hinged at the top and are held open by props during operation.

Section IV (U). PHYSICAL DESCRIPTION OF THE LOPAR, MISSILE TRACK, TARGET TRACK, AND TARGET RANGE ANTENNA–RECEIVER–TRANSMITTER GROUPS

53 (U). LOPAR Antenna-Receiver-Transmitter Group

Note. The key numbers shown in parentheses in *a* through *g* below refer to figure 36 unless otherwise indicated.

a. General. The LOPAR antenna-receiver-transmitter group (10, fig. 15, and 8, fig. 13) contains the receiving and transmitting equipment and the antenna of the LOPAR system. The LOPAR antenna-receiver-transmitter group is 13½ feet in height and weighs approximately 2,500 pounds. Major components are the acquisition antenna (1), acquisition modulator (8), acquisition receiver-transmitter (10), acquisition antenna pedestal (13), and auxiliary antenna subassembly (16). External cables (11) and flexible waveguides (2 and 12) interconnect the major components. The LOPAR antenna-receiver-transmitter group also contains SIF/IFF equipment. The major components, the SIF/IFF equipment, and other miscellaneous components of the LOPAR antenna-receiver-transmitter group are described in *b* through *h* below.

Note. All the components located below the acquisition antenna are identified collectively as the "barbett."

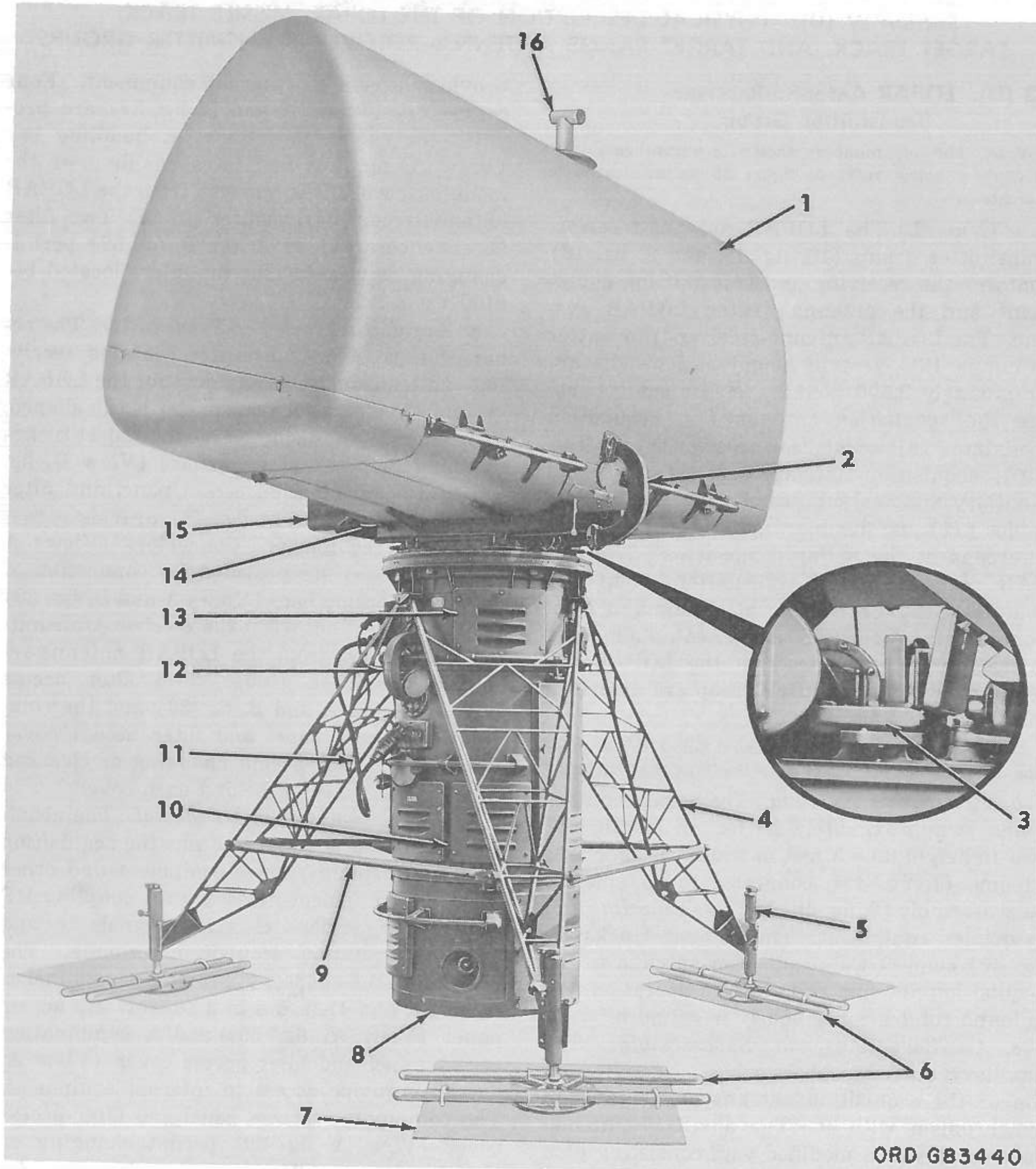
b. Acquisition Antenna. The acquisition antenna is approximately 15 feet in length, 6¼ feet in height, and 5 feet in width. A fiberglass radome (1, fig. 40), connected to an antenna base assembly (6, fig. 40) encloses reflectors and associated equipment. The antenna tracks (3, fig. 40) connect the acquisition antenna to the acquisition antenna pedestal. In operation, the antenna rotates continuously in azimuth.

c. Auxiliary Antenna Subassembly. The auxiliary antenna subassembly is mounted on top of the acquisition antenna and rotates in synchronism with it. The auxiliary antenna subassembly is a modified yagi consisting of a driven dipole and nine parasitic elements. This antenna is designated for receiving only.

d. Acquisition Modulator. The acquisition modulator contains high voltage and pulse generating equipment associated with the transmitter system. The modulator is tub-shaped, approximately 27 inches in height and 41 inches in diameter. An access panel (View A, fig. 37) provides access to internal equipment. Four connectors (Views A and B, fig. 37) are provided for cable connections. A handling bar (View A, fig. 37) facilitates handling of the modulator when it is removed from the LOPAR antenna-receiver-transmiter group. Two filter access covers (Views A and B, fig. 37) permit changing or cleaning the air filters located behind each cover.

e. Acquisition Receiver-Transmitter. The acquisition receiver-transmitter contains receiving and transmitting equipment for the LOPAR system. The receiver-transmitter is tub-shaped, approximately 43 inches in height and 41 inches in diameter. Two access panels (View B, fig. 38) and a combination access panel and filter access cover (View A, fig. 38) provide access to internal equipment. Connectors (Views A and B, fig. 38) are provided for connection of cables. Handling bars (Views A and B, fig. 38) facilitate handling when the receiver-transmitter is removed from the LOPAR antenna-receiver-transmitter group. Two filter access covers (Views A and B, fig. 38) and the combination access panel and filter access cover (View A, fig. 38) permit changing or cleaning the air filters located behind each cover.

f. Acquisition Antenna Pedestal. The acquisition antenna pedestal contains the acquisition antenna (azimuth) drive equipment and other electrical equipment necessary for coupling RF energy and various electrical signals to and from the rotating acquisition antenna. The pedestal is tub-shaped, approximately 20 inches in height and 41 inches in diameter. An access panel (View A, fig. 39) and a combination access panel and filter access cover (View A, fig. 39) provide access to internal equipment. The combination access panel and filter access cover (View A, fig. 39) permit changing or cleaning the air filters behind each cover. An antenna disable switch cover (View B, fig. 39) provides access to the antenna disable switch. An OIL FILL plug and an OIL DRAIN plug are located on the outside of the pedestal. Five connectors (View A, fig. 39) are provided for connection of cables. A handling bar (View B, fig. 39) facilitates handling when the pedestal



1—Acquisition antenna
2—Flexible waveguide
3—Acquisition orientation level
4—Antenna pedestal leg (3)
5—Leveling jack (3)
6—Bar (6)
7—Concrete pad (3)
8—Acquisition modulator
9—Horizontal crossbar (3)
10—Acquisition receiver-transmitter
11—External cables
12—Flexible waveguide
13—Acquisition antenna pedestal
14—Catch (2)
15—Cover assembly
16—Auxiliary antenna subassembly

Figure 36 (U). LOPAR antenna-receiver-transmitter group—overall view (U).

is removed from the LOPAR antenna-receiver-transmitter group. Two clamping bars (View B, fig. 39) connect the acquisition antenna to the pedestal. On NIKE-HERCULES Systems 1001 through 1021 there is an azimuth scale around the top of the acquisition antenna pedestal. On systems 1022 and above the azimuth scale is removed.

g. SIF/IFF Equipment. The SIF/IFF antenna (2, fig. 40) is attached to a holding bar (5, fig. 40) on the lower portion of the acquisition antenna. The receiver-transmitter (3, fig. 41), coder control unit (2, fig. 41), and recognition signal simulator (1, fig. 41) are located on the opposite side of the acquisition antenna from the SIF/IFF antenna, as shown in figure 40.

h. Miscellaneous Components.

(1) Three antenna pedestal legs (4, fig. 36), constructed of tubular steel, support the LOPAR antenna-receiver-transmitter group. Three horizontal crossbars (9, fig. 36) connect the legs for bracing. At the foot of each leg is a leveling jack (5, fig. 36). The base of each jack is a disk on which two bars (6, fig. 36) are mounted. The bars are secured to concrete pads (7, fig. 36). An acquisition orientation level (3, fig. 36) is mounted on top of the acquisition antenna pedestal, directly beneath the acquisition antenna. The level is housed in a case (fig. 42) approximately 5 inches wide, 7 inches long, and 1½ inches high. Two levels are positioned at 90 degrees from each other within the case. Two sighting bars, each hinged at opposite ends of the base plate, swing to a vertical position for use and fold downward for storage. The levels are used for leveling the acquisition antenna, and the sighting bars are used to orient the acquisition antenna azimuth positioning circuits with respect to the battery orientation requirements.

Note. **The key numbers shown in parentheses in (2) below refer to figure 43 unless otherwise indicated.**

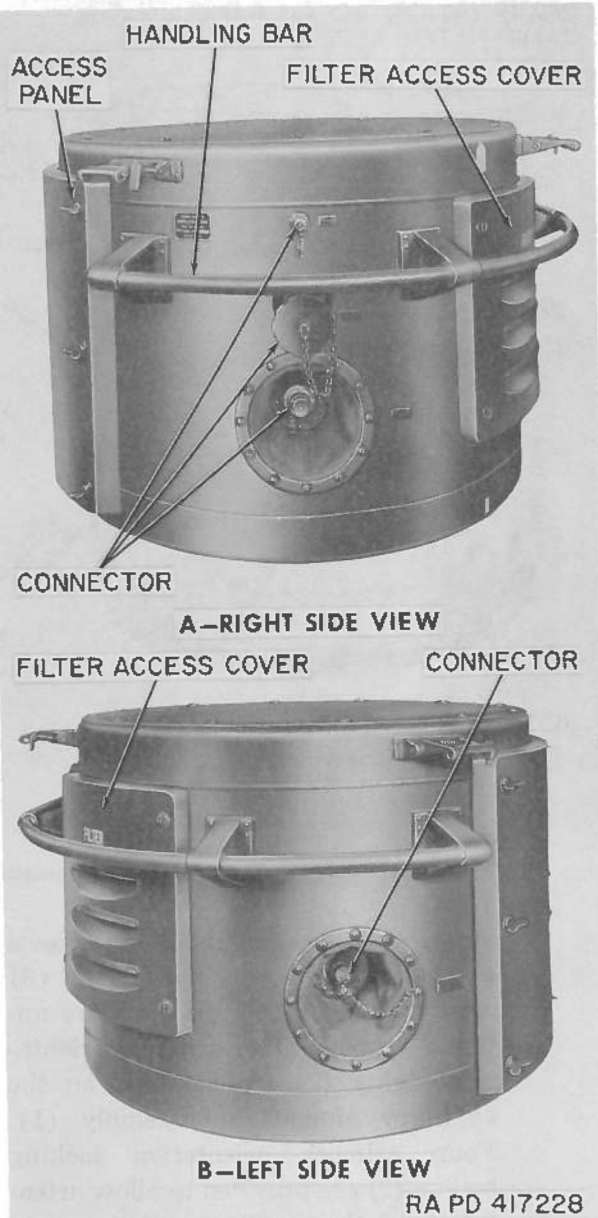


Figure 37 (U). Acquisition modulator (U).

(2) The level assembly (4) for the auxiliary antenna subassembly normally will be stored in the antenna case in the electronic shop building, as shown in figure 13 on permanent sites. The level assembly is attached to the auxiliary antenna support with level mounting screws (3). Two levels (5) are positioned at 90 degrees to one another. Two socket-head screw

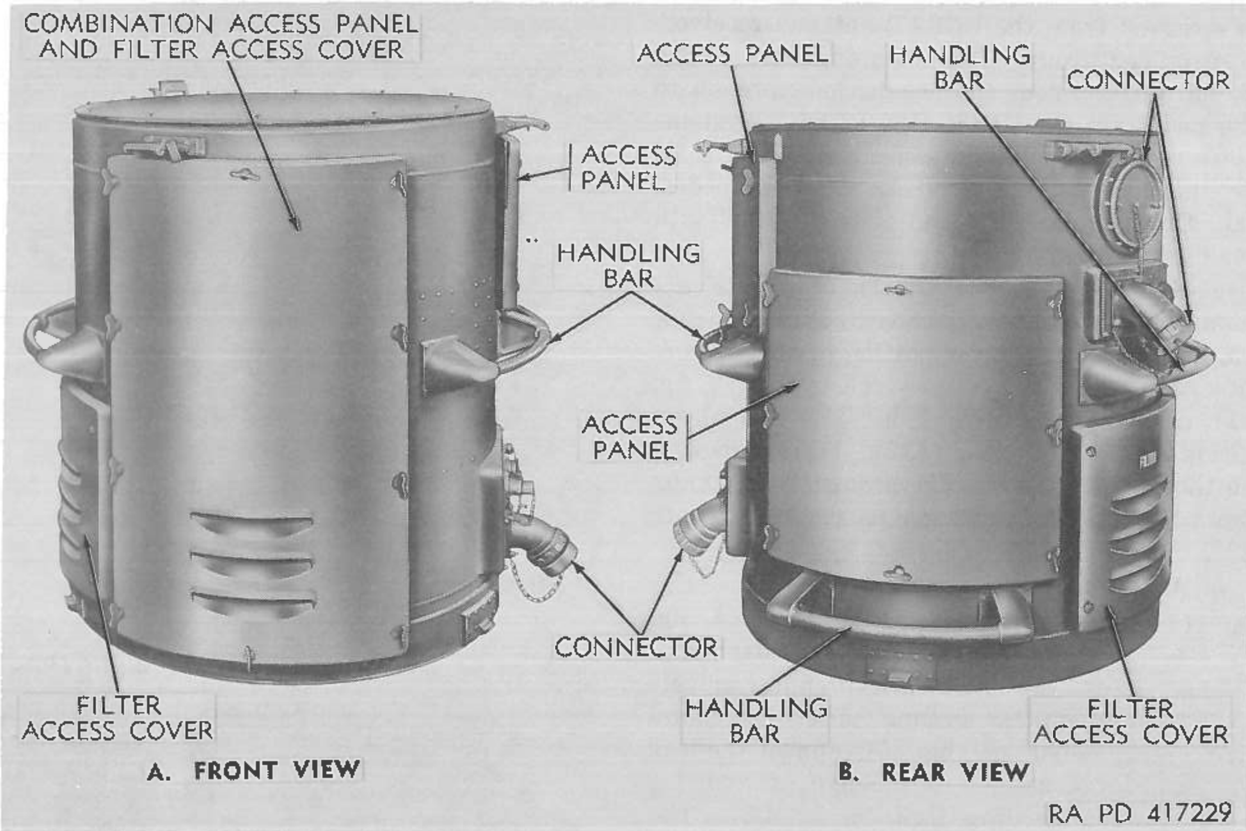


Figure 38 (U). Acquisition receiver-transmitter (U).

wrenches (6) are mounted on the level assembly. Four leveling screws (8) are provided to level the auxiliary antenna support. Two azimuth orientation sights (2) are mounted on the auxiliary antenna subassembly (1). Four azimuth orientation locking screws (9) are provided to allow orientation of the auxiliary antenna subassembly. The RF transmission line (7) couples the RF energy from the auxiliary antenna subassembly to the acquisition antenna pedestal (13, fig. 36). The levels are used for leveling the auxiliary antenna subassembly. The azimuth orientation sights are used to orient the auxiliary antenna subassembly with respect to the position of the acquisition antenna (1, fig. 36).

54 (U). Missile Track, Target Track, and Target Range Antenna-Receiver-Transmitter Groups

Note. The missile track, target track, and target range antenna-receiver-transmitter groups are externally similar in physical appearance; therefore, only the missile track antenna-receiver-transmitter group is described in this paragraph. Differences in nomenclature for corresponding components of the three antenna-receiver-transmitter groups are indicated in the legends of the applicable illustrations.

a. General. Major components of the missile track antenna-receiver-transmitter group are the track antenna reflector assembly (2, fig. 44), missile track receiver-transmitter (3, fig. 44), track antenna pedestal (6, fig. 44), azimuth drive equipment enclosure (7, fig. 44), and track antenna radome (8, fig. 45). If DA MWO 9-1430-250-20/2/1 has been incorporated, the antenna pedestal fairings (2, fig. 46) are also a major component. The pedestal, receiver-transmitter, reflector assembly, and radome can be rotated 360 degrees in azimuth. The receiver-

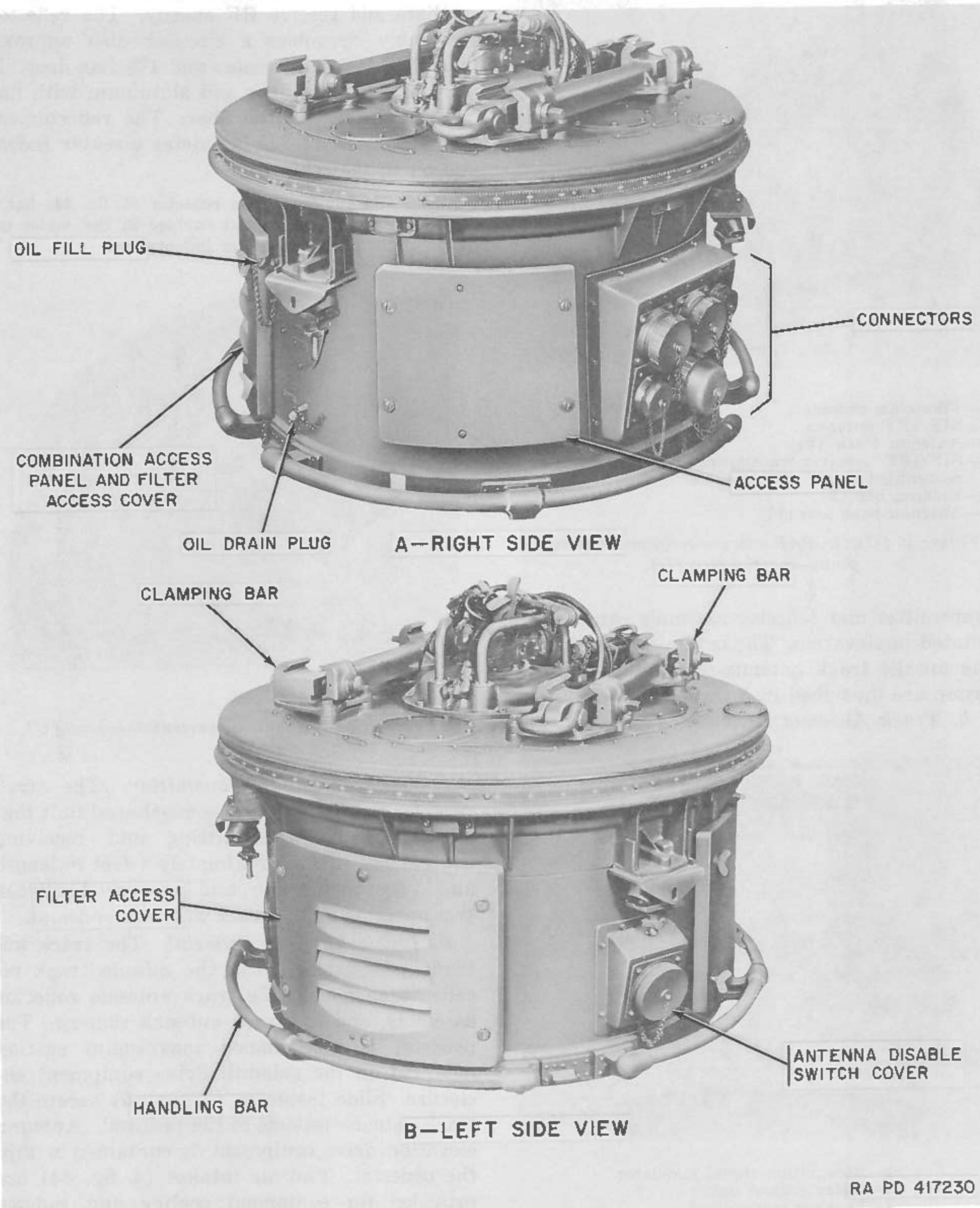
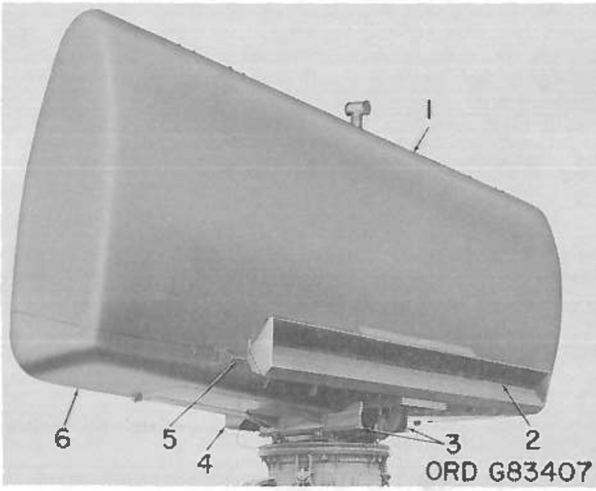


Figure 39 (U). Acquisition antenna pedestal (U).



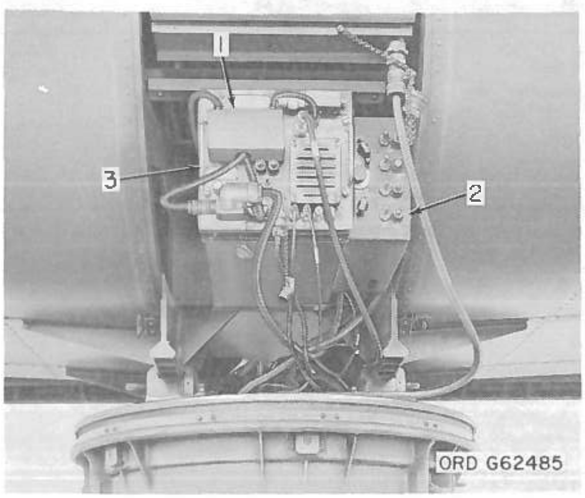
1—Fiberglass radome
2—SIF/IFF antenna
3—Antenna track (2)
4—SIF/IFF receiver-transmitter, coder control, and recognition signal simulator
5—Holding bar (2)
6—Antenna base assembly

Figure 40 (U). LOPAR antenna-receiver-transmitter group—partial view (U).

transmitter and reflector assembly can also be rotated in elevation. The major components of the missile track antenna-receiver-transmitter group are described in *b* through *g* below.

b. Track Antenna Reflector Assembly. The track antenna reflector assembly is used to radiate and receive RF energy. The reflector assembly resembles a circular dish approximately 8 feet in diameter and 1⅔ feet deep. It is constructed of fiber and aluminum with fine wire embedded in the fiber. The reflector assembly has a 42-inch diameter circular indentation in the center.

Note. The range antenna reflector (1, fig. 44) has a 5-inch diameter circular flat surface in the center instead of the 42-inch diameter indentation.



1—Recognition signal simulator
2—Coder control unit
3—Receiver-transmitter

Figure 41 (U). SIF/IFF receiver-transmitter, coder control unit, and recognition signal simulator—installed (U).

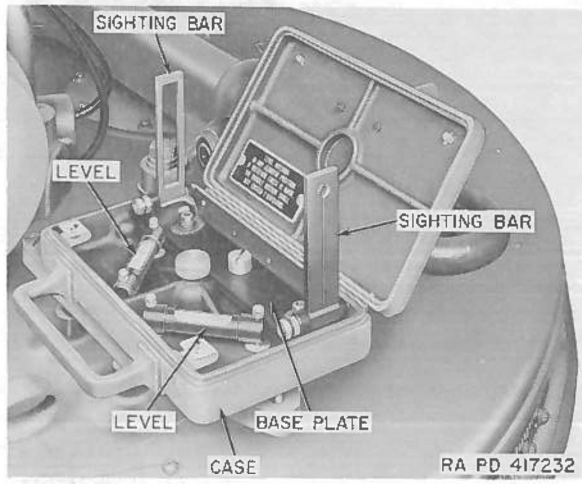
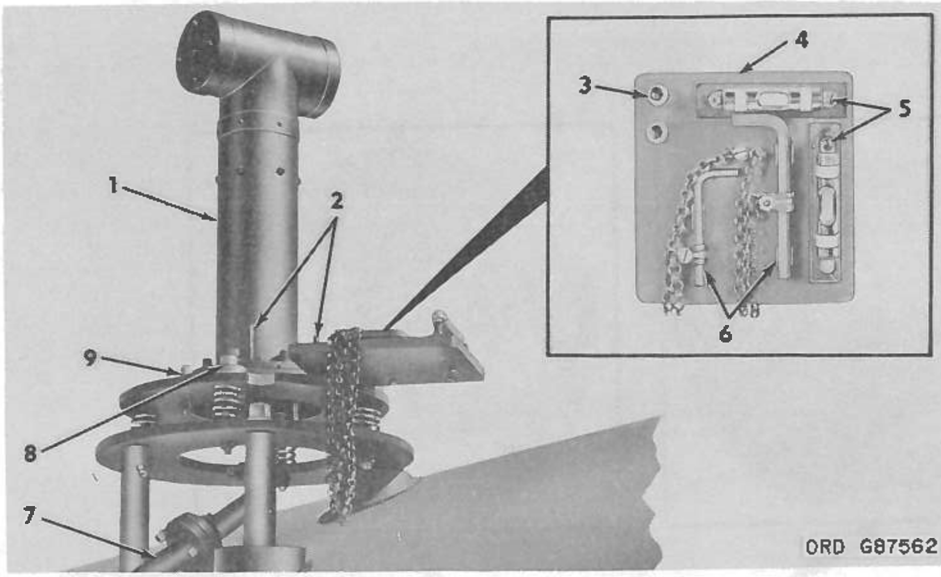


Figure 42 (U). Acquisition orientation level (U).

c. Track Receiver-Transmitter. The track receiver-transmitter is a dome-shaped unit that contains radar transmitting and receiving equipment. It is approximately 4 feet in length and ⅓ foot in diameter, and is mounted between two uprights of the track antenna pedestal.

d. Track Antenna Pedestal. The track antenna pedestal supports the missile track receiver-transmitter, the track antenna reflector assembly, and the track antenna radome. The pedestal is a U-shaped magnesium casting mounted on the azimuth drive equipment enclosure. Slide fasteners (7, fig. 45) secure the track antenna radome to the pedestal. Antenna elevation drive equipment is contained within the pedestal. Two air intakes (4, fig. 44) are provided for equipment cooling and radome pressurization.

e. Azimuth Drive Equipment Enclosure. The azimuth drive equipment enclosure supports the



1—Auxiliary antenna subassembly
2—Azimuth orientation sight (2)
3—Level mounting screws (2)
4—Level assembly
5—Level (2)
6—Socket-head screw wrench (2)
7—RF transmission line
8—Leveling screw (4)
9—Azimuth orientation locking screw (4)

Figure 43 (U). Auxiliary antenna subassembly and level (U).

track antenna pedestal, and contains antenna azimuth drive equipment and other electrical and electronic equipment. The enclosure is approximately 8 feet long, 6 feet wide, and 5 feet high, including the three leveling jack legs (8, fig. 44). An access door (9, fig. 44) provides access to internal equipment.

f. Track Antenna Radome. The track antenna radome (8, fig. 45) is a waterproof hood made of silicon-rubber-coated Orlon. The radome encloses the track antenna reflector assembly, the missile track receiver-transmitter, and the track antenna pedestal. The radome is secured to the pedestal by slide fasteners (7, fig. 45). In operation, the radome is internally pressurized with air so that it attains a spherical balloon-like shape. The spherical shape reduces the wind drag. Three slide fasteners (6, fig. 45) are provided to permit access to equipment through a rectangular opening in the radome.

g. Antenna Pedestal Fairings. With DA MWO 9-1430-250-20/2/1 incorporated, the ability to operate effectively during severe winds is increased by the addition of the antenna pedestal fairings (2, fig. 46) to the target track and missile track antenna-receiver-transmitter groups.

1—Range antenna reflector (target range antenna-receiver-transmitter group)
2—Track antenna reflector assembly (missile or target track antenna-receiver-transmitter group)
3—Missile track receiver-transmitter (missile track antenna-receiver-transmitter group)
Target track receiver-transmitter (target track antenna-receiver-transmitter group)
Range receiver-transmitter (target range antenna-receiver-transmitter group)
4—Air intake (2)
5—BLOWER switch
6—Track antenna pedestal (missile track antenna-receiver-transmitter group)
Target track antenna support (target track antenna-receiver-transmitter group)
Range antenna pedestal (target range antenna-receiver transmitter group)
7—Azimuth drive equipment enclosure (missile track antenna-receiver-transmitter group)
Target track antenna support base (target track antenna-receiver-transmitter group)
Range antenna support base (target range antenna-receiver-transmitter group)
8—Leveling jack leg (3)
9—Access door
10—Quick disconnect for TRR waveguide

Figure 44 (U). MTR, TTR, or TRR antenna-receiver-transmitter group—overall view—less track antenna radome—legend (U).

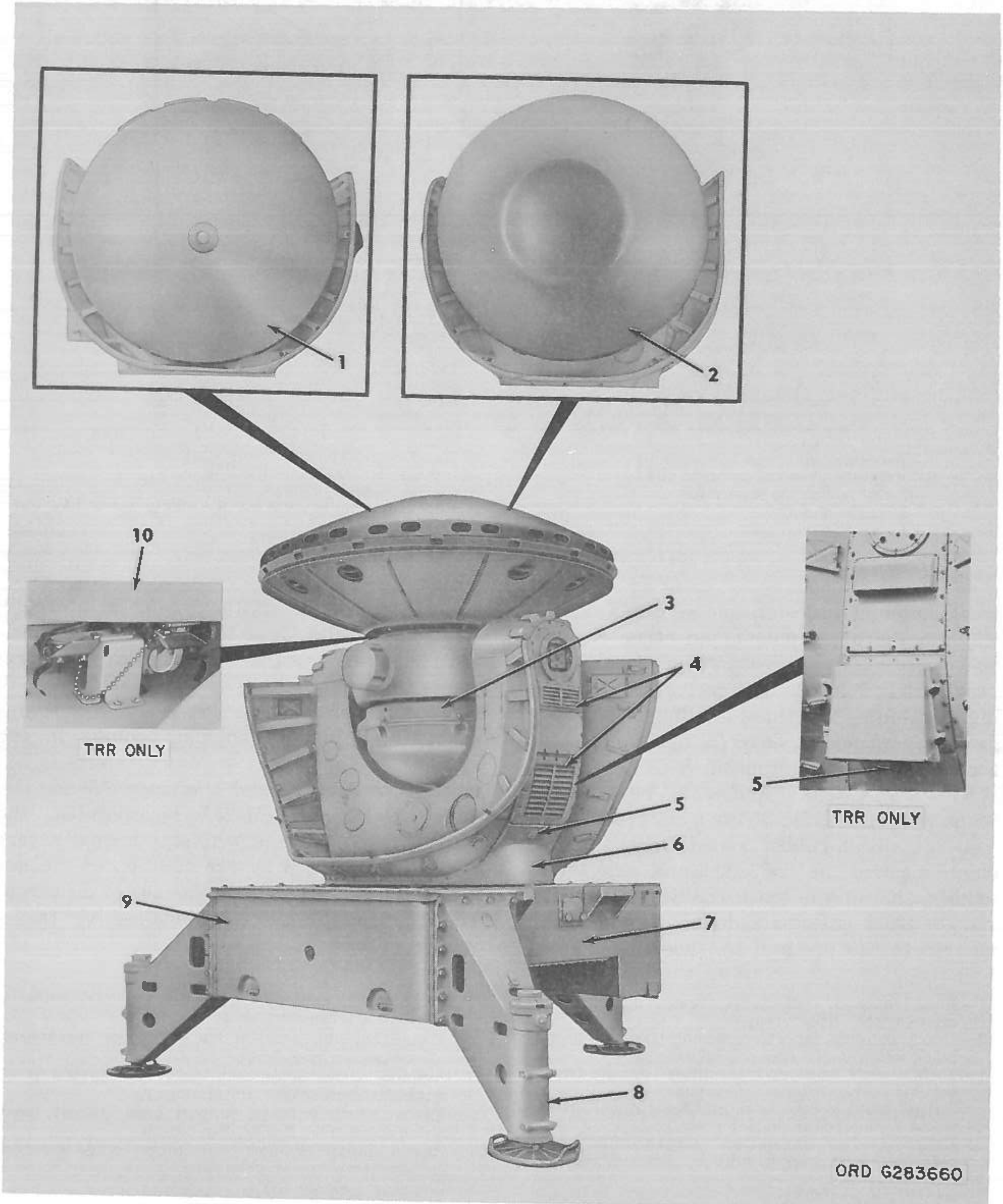
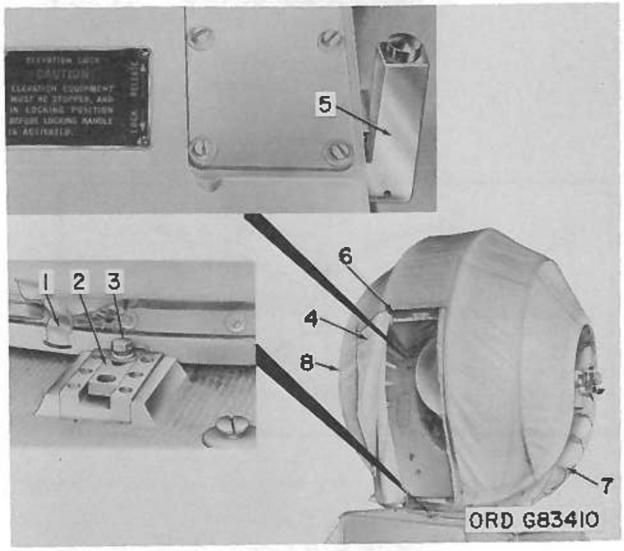
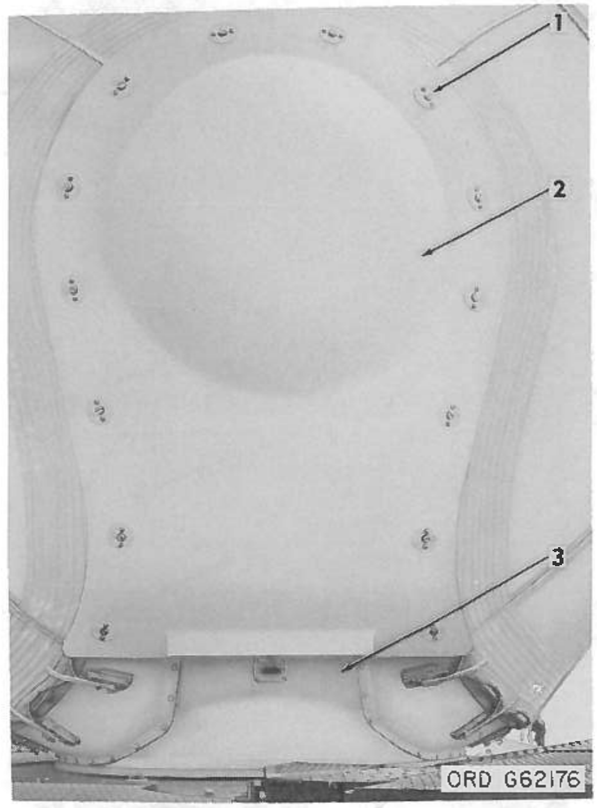


Figure 44 (U). MTR, TTR, or TRR antenna-receiver-transmitter group—overall view —less track antenna radome (U).



1—Track antenna pedestal
2—Slide (azimuth antirotational lock)
3—Hexagon-hd bolt
4—Radome door
5—Elevation lock
6—Slide fastener (3)
7—Slide fastener
8—Track antenna radome

Figure 45 (U). MTR, TTR, or TRR antenna-receiver-transmitter group—typical partial side view (U).



1—Latch (14)
2—Antenna pedestal fairings
3—Track antenna pedestal

Figure 46 (U). MTR or TTR antenna-receiver-transmitter group—partial side view—with DA MWO 9-1430-250-20/2/1 installed (U).

Section V (U). PHYSICAL DESCRIPTION OF THE RADAR TEST SET GROUP

55 (U). General

The radar test set group (1, fig. 13 and 1, fig. 15) is used to aline and test the TTR, TRR, and MTR systems. Major components of the radar test set group are the antenna assembly-mast group, radar test set, and RF detector. These components are described in paragraphs 56 through 58.

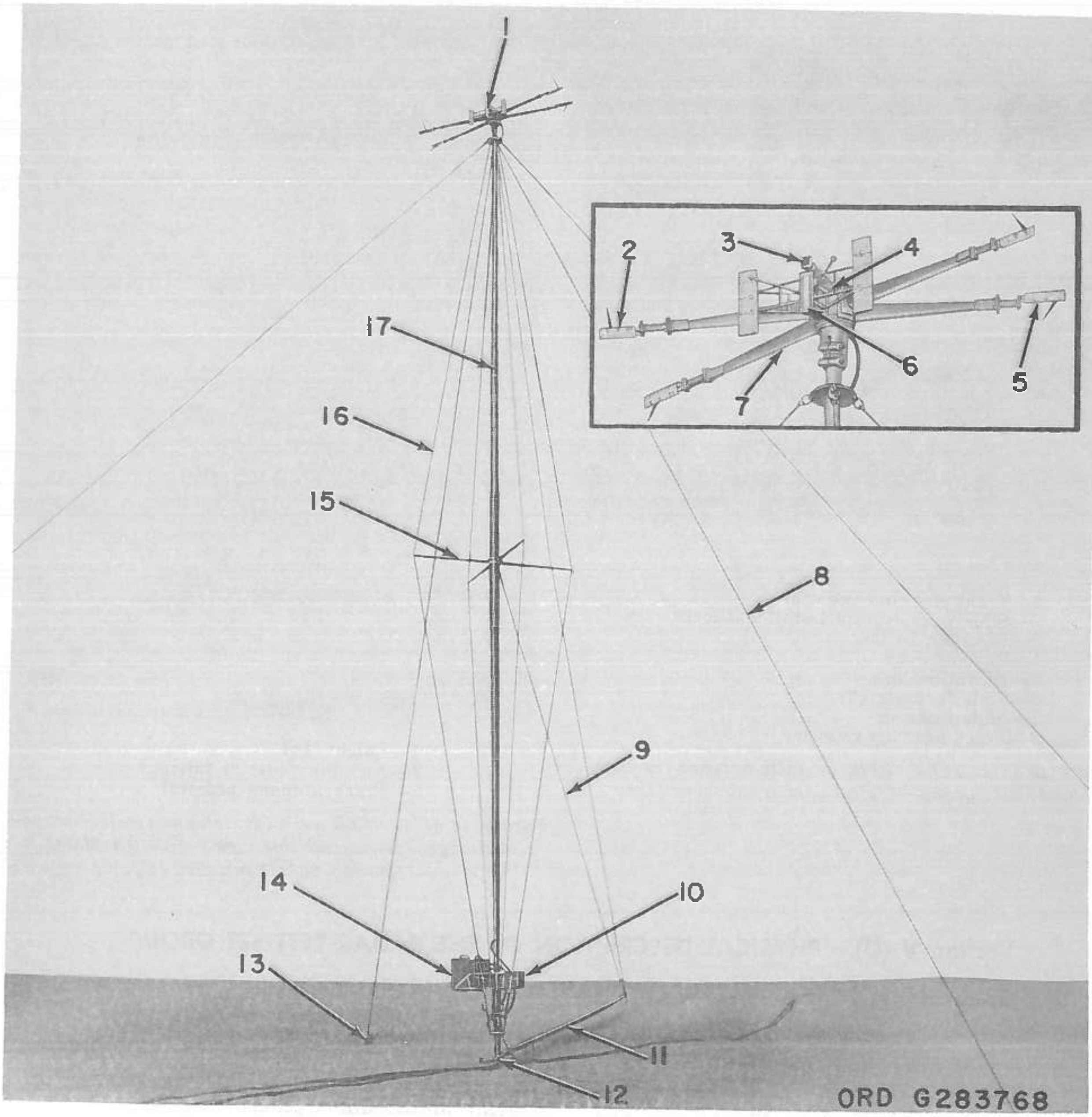
56 (U). Antenna Assembly-Mast Group

Note. The key numbers shown in parentheses through *b* below refer to figure 47.

The antenna assembly-mast group consists of the mast (17), radar test antenna assembly (1), base plate and yoke group (12), boom (11), lifting wire ropes (9), guy wire ropes (8), guy wire rope hoists (13), stay wire assembly (15), and stay wire ropes (16).

a. The mast is tapered and is approximately 60 feet in height. It is constructed of seven tubular aluminum sections.

b. The radar test antenna assembly consists primarily of four indicator arms (7), two waveguide horns (3 and 6), six sighting bars (4 azimuth and 2 elevation) (5), six scale dials (4 azimuth and 2 elevation) (2), and a mast support (4). The indicator arms, sighting bars, and scale dials are used in alinement of the TTR and MTR systems. One waveguide horn (6) is connected to the radar test set (14) through a waveguide suspended within the tubular mast. The other waveguide horn (3) is similarly connected to the RF detector (10) by



1—Radar test antenna assembly
2—Scale dial (6) (4 azimuth and 2 elevation)
3—Waveguide horn
4—Mast support
5—Sighting bar (6) (4 azimuth and 2 elevation)
6—Waveguide horn
7—Indicator arm (4)
8—Guy wire rope (4)
9—Lifting wire rope (2)
10—RF detector
11—Boom
12—Base plate and yoke group
13—Guy wire rope hoist (4)
14—Radar test set
15—Stay wire assembly
16—Stay wire rope (4)
17—Mast

Figure 47 (U). Radar test set group—overall view (U).

another waveguide within the mast. Both waveguide horns are adjustable in elevation so that they can be alined to the antenna-receiver-transmitter groups. The mast support is connected to the mast and supports the indicator arms and waveguide horns.

c. The base plate and yoke group supports the mast, and is designed so that the mast can be rotated 360 degrees in azimuth and locked in any desired position.

d. The boom, attached to the base plate and yoke group, is used with two lifting wire ropes to erect the mast, and is used as a lever to rotate the mast after it is erected.

e. Four guy wire ropes hold the mast upright. The four guy wire rope hoists are used to erect the mast and to provide tension on the guy wire ropes.

f. The stay wire assembly and four stay wire ropes prevent excessive bowing or bending of the mast.

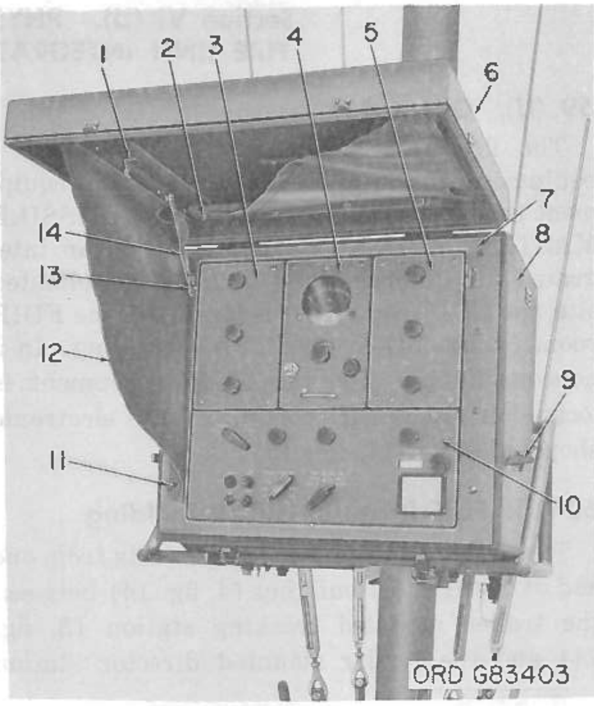
57 (U). Radar Test Set

Note. The key numbers shown in parentheses in this paragraph refer to figure 48 unless otherwise indicated.

The radar test set (14, fig. 47), mounted on the bottom section of the mast, is used to simulate missile-transmitted or target-return signals for the purpose of performing checks and adjustments of the MTR and TTR systems. The test set is approximately 20 inches high, 24 inches wide, and 16 inches deep. A door assembly (6) opens upward to permit access to a missile oscillator (3), target oscillator (5), RF power meter (4) and test set monitor indicator panel (10). The cover forms a waterproof seal when closed and locked. A connector on the back of the test set is used for connecting a power and control cable from the trailer mounted tracking station. A waveguide connector on the back of the test set is connected to a waveguide from the radar test antenna assembly.

58 (U). RF Detector

The RF detector (10, fig. 47), mounted on the bottom section of the mast opposite the radar test set, produces an indication of RF signal strength for the purpose of alining the TRR system. The RF detector is a sealed unit containing an RF detector subassembly and a semiconductor device holder. The RF detector is approximately 7 inches high, 12 inches wide, and 17 inches long. A connector on the side of the RF detector is used for connecting a power and control cable from the target range antenna-receiver-transmitter group. A waveguide connector on the back of the RF detector connects to a waveguide from the radar test antenna assembly.



1—Clip (2)
2—Snap (4)
3—Missile oscillator
4—RF power meter
5—Target oscillator
6—Door assembly
7—Electrical equipment drawer
8—Radar test set cabinet
9—Latch (4)
10—Test set monitor indicator panel
11—Snap (8)
12—Canvas shield (2)
13—Bracket (2)
14—Brace (2)

Figure 48 (U). Radar test set—front view (U).

Section VI (U). PHYSICAL DESCRIPTION OF THE FIRE UNIT INTEGRATION FACILITY EQUIPMENT

59 (U). General

The fire unit integration facility (FUIF) equipment in the RCDC consists of the equipment that connects the RCDC with a MISSILE MASTER or MISSILE MONITOR in an integrated air defense system. In a consolidated site, the FUIF equipment is located in the FUIF room (1, fig. 14) in the HIPAR building. In a nonconsolidated site, the FUIF equipment is located in the FUIF portion of the electronic shop building (11, fig. 13).

60 (U). FUIF Room in HIPAR Building

The FUIF room (1, fig. 14) projects from one end of the HIPAR building (4, fig. 14) between the trailer mounted tracking station (3, fig. 14) and the trailer mounted director station (2, fig. 14). The FUIF room is accessible through an outside door at the end of the building. The room contains the FUIF terminal equipment and miscellaneous FUIF equipment. Air conditioning and heating of the FUIF room is provided by the central air conditioning and heating equipment of the HIPAR building.

61 (U). FUIF Portion of Electronic Shop Building

The FUIF portion of the electronic shop building (6, fig. 15) consists of two separate rooms that are accessible only through two outside doors. One room houses the FUIF terminal equipment and miscellaneous FUIF equipment, and the other room houses an air conditioning unit and a heating unit for the FUIF portion of the building.

Section VII (U). PHYSICAL DESCRIPTION OF THE POWER BUILDING AND ELECTRICAL POWER PLANT

62 (U). General

The power building (12, fig. 15 and 5, fig. 13) contains the electrical power plant, which supplies electrical power for the RCDC. The power building is constructed and maintained by the Corps of Engineers who also furnish, install, and maintain the electrical power plant.

63 (U). Power Building

a. General. When a NIKE-HERCULES System site is converted into an Improved NIKE-HERCULES System nonconsolidated site with HIPAR, the existing power building is modified and enlarged to an area approximately 1,250 square feet. In a consolidated site, the power building is constructed specifically for the Improved NIKE-HERCULES System and is more compact, having an area of approximately 800 square feet. The same general building configuration is employed in both consolidated and nonconsolidated sites. The general configuration of the power building, described in *b* and *c* below, is the same for both consolidated and nonconsolidated sites.

Note. The key numbers shown in parentheses in *b* and *c* below refer to figure 49.

b. Exterior of Building. The power building in a nonconsolidated site is shown in figure 49. Three exhaust mufflers (7) are mounted on one side of the building outside of the generator room. The mufflers connect to the exhaust systems of three 170-kw engine alternators. Three radiators (8) are emplaced below the mufflers between concrete walls. The radiators connect to the water cooling systems of the three alternators. At one end of the building is a concrete transformer pad (13) enclosed by a wire fence topped by barbed wire. Commercial power transformer equipment is emplaced on the transformer pad.

c. Interior of Building. A cutaway view of the power building in a nonconsolidated site is shown in figure 49. The building is divided into a control room (4) and a generator room (5) separated by a soundproof partition. In a consolidated site the rooms are combined. The control room contains control equipment and maintenance facilities. The generator room contains power generating and distribution equipment.

64 (U). Electrical Power Plant

Note. The key numbers shown in parentheses in *a* through *f* below refer to figure 49.

a. General. The electrical power plant comprises the equipment contained in the power building. Similar equipment is used in both consolidated and nonconsolidated sites. Major components include the circuit breaker-meter assembly (1), circuit breaker assembly (2), three 170-kw engine alternator control cabinets (3), three 170-kw engine alternators (6), two 400-cycle motor alternators (9), a 400-cycle junction box (10), and a 400-cycle load transfer switch (11). These components are described in *b* through *h* below. Also, two storage cabinets (12) are provided.

b. Circuit Breaker-Meter Assembly. The circuit breaker-meter assembly is located in the control room (4) adjacent to the circuit breaker assembly. The circuit breaker-meter assembly is approximately 7 feet 8 inches high, 3 feet 4 inches wide, and 4 feet deep. Three power cables and three control cables connect the meter assembly to the three 170-kw engine alternators. Another cable connects the meter assembly to a utility box.

c. Circuit Breaker Assembly. The circuit breaker assembly is located in the control room between the circuit breaker-meter assembly and a 170-kw engine alternator control cabinet (3). The circuit breaker assembly is approximately 8 feet high, 2 feet wide, and 4 feet deep. It contains the main circuit breaker, a reverse power relay, and controls for distributing commercial power to the 400-cycle motor alternators and to a 60-cycle distribution buss.

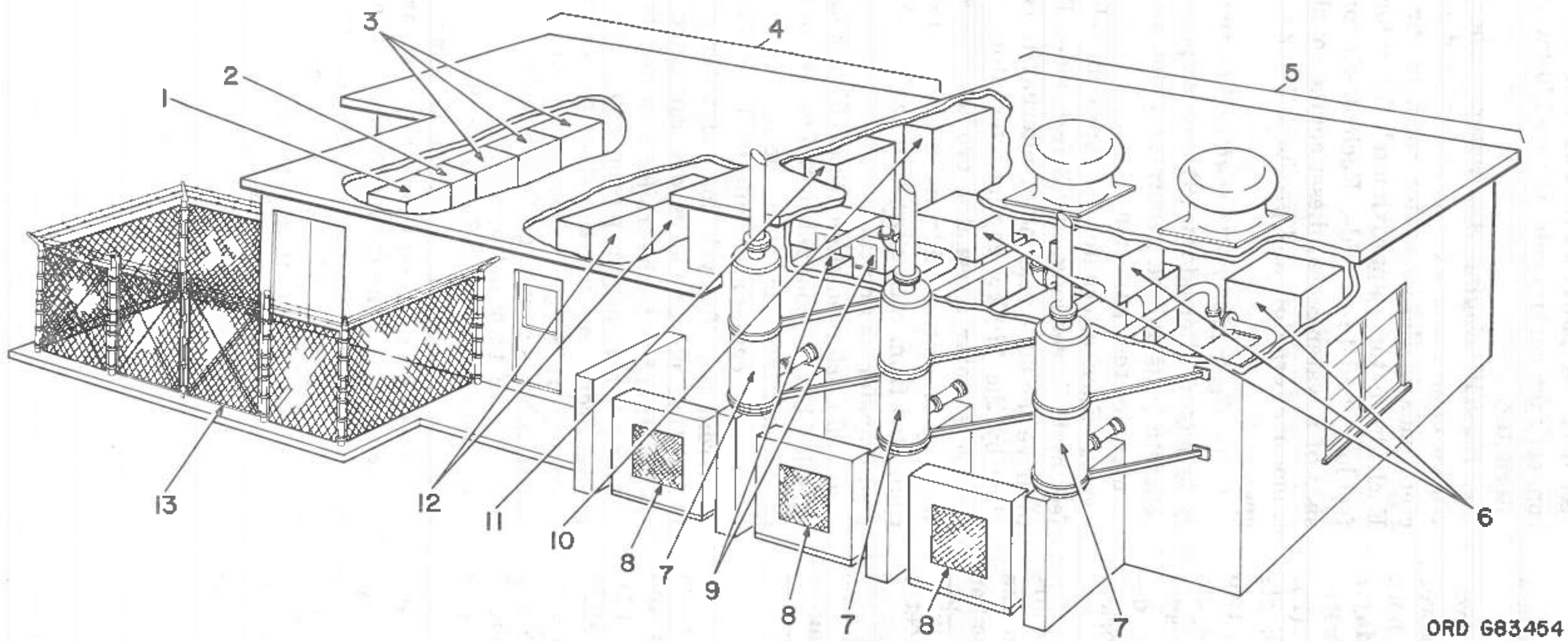
d. 170-KW Engine Alternator Control Cabinets. The three 170-kw engine alternator control cabinets are located side by side in the control room adjacent to the circuit breaker assembly. Each control cabinet is approximately 7½ feet high, 2½ feet wide, and 2½ feet deep. A power cable and a control cable connect each control cabinet to a 170-kw engine alternator.

e. 170-KW Engine Alternators. The three 170-kw engine alternators are emplaced on concrete pads in the generator room (5, fig. 49). Each alternator is approximately 8 feet high, 13 feet long, and 4 feet wide. Each alternator consists of a water-cooled diesel engine coupled to a motor alternator, and produces 170-kw at 60 cps.

f. 400-Cycle Motor Alternators. The two 400-cycle motor alternators (9) are emplaced on concrete pads in the generator room, perpendicular to the partition separating the two rooms. Each alternator is approximately 5½ feet high, 7 feet long, and 3 feet wide. Power to drive the 400-cycle motor alternators is supplied by the 170-kw engine alternators. Each 400-cycle motor alternator produces 60 kw at 400 cps. A control cable and a power cable are connected from each alternator to the 400-cycle load transfer switch.

g. 400-Cycle Junction Box. The 400-cycle junction box is mounted in the generator room on the partition separating the two rooms. Two input power cables are connected to the junction box from the 400-cycle load transfer switch; two output power cables are connected from the junction box to the trailer mounted director station; three output power cables are connected from the junction box to the trailer mounted tracking station; and one output power cable is connected from the junction box to the FUIF terminal equipment.

h. 400-Cycle Load Transfer Switch. The 400-cycle load transfer switch is mounted in the generator room on the partition separating the two rooms. One input power cable and one control cable are connected to the load transfer switch from each of the two 400-cycle motor alternators. Two output power cables are connected from the load transfer switch to the 400-cycle junction box.



1—Circuit breaker-meter assembly
2—Circuit breaker assembly
3—170-kw engine alternator control cabinet (3)
4—Control room
5—Generator room
6—170-kw engine alternator (3)
7—Exhaust muffler (3)
8—Radiator (3)
9—400-cycle motor alternator (2)
10—400-cycle junction box
11—400-cycle load transfer switch
12—Storage cabinet (2)
13—Transformer pad

Figure 49 (U). Power building—cutaway view (U).

Section VIII (C). OPERATING DATA

65 (U). General

This section contains operating data pertaining to the RCDC. Paragraph 66 contains overall operating data. Paragraphs 67 through 73 contain data pertinent to major components of the system.

66 (C). Overall Operating Data

a. Primary Power Requirements.

(1) *400-cycle requirements.* The 400-cycle power requirements are given below.

Trailer mounted director station	18.5 kw
Trailer mounted tracking station	34.0 kw
FUIF equipment	4.0 kw
Total	56.5 kw

(2) *60-cycle requirements.* The 60-cycle power requirements for selected temperature zones [1], which differ between consolidated and nonconsolidated site, are given below.

Item	*Consolidated*	*Nonconsolidated*
HIPAR system	205.0 kw	205.0 kw
HIPAR building (air conditioners, heating, and lights, including FUIF room in consolidated site)		
+20° C zone	122.2 kw	78.0 kw
0° C zone	133.2 kw	84.0 kw
−20° C zone	146.2 kw	93.0 kw
Electronic shop building		
+20° C zone	....	60.8 kw
0° C zone	....	66.3 kw
−20° C zone	....	71.3 kw
Power building (heating, lights, ventilating fans, and battery charger)		
+20° C zone	44.3 kw	44.3 kw
0° C zone	50.5 kw	50.6 kw
−20° C zone	60.0 kw	61.0 kw
400-cycle motor alternators	70.0 kw	70.0 kw
Administrative base load [2]	75.0 kw	75.0 kw
Totals		
+20° C zone	516.5 kw	533.1 kw
0° C zone	533.7 kw	550.9 kw
−20° C zone	556.2 kw	575.3 kw

[1] Temperatures specified were chosen only to indicate the difference in power requirements as the temperature changes.

[2] This is optional when operating from engine alternator power.

b. System Warmup Time Requirements.[3]

HIPAR system	15 minutes
LOPAR system	5 minutes
TTR and MTR systems	5 minutes
TRR system	5 minutes
Computer system	30 seconds

[3] Ideal warmup time for each system is 30 minutes.

67 (C). LOPAR System Operating Data

a. Antenna System.

Antenna elevation angle	Variable from 35.5 to 391 mils
Antenna azimuth beam width	25 mils
Azimuth coverage	Continuous through 6,400 mils
Antenna rotational speed	5, 10, or 15 rpm
Antenna azimuth drive	3-speed, 400-cps, 3-phase motor
Elevation scan rate	40 seconds (up and down from 35 to 391 mils)
Pencil beam range	250,000 yards
Cosecant squared beam range	175,000 yards
Accuracy	±150 yards in range, 18 mils in azimuth
Scan condition 1	Pencil beam at 35 mils elevation; beam changing from pencil beam to cosecant squared beam between 35 and 107 mils; cosecant squared beam from 107 to 391 mils. Scans from 35 to 356 mils in automatic scan.
Scan condition 2	Pencil beam from 35 to 107 mils elevation; beam changing from pencil beam to cosecant squared beam between 107 and 178 mils; cosecant squared beam from 178 to 391 mils. Scans from 35 to 196 mils in automatic scan.
Scan condition 3	Pencil beam from 35 to 178 mils elevation; beam changing from pencil beam to cosecant squared beam between 178 and 249 mils; cosecant squared beam from 249 to 391 mils. Scans from 35 to 267 mils in automatic scan.
Scan condition 4	Pencil beam from 35 to 249 mils elevation; beam changing from pencil beam to cosecant squared beam between 249 and 320 mils; cosecant squared beam from 320 to 391 mils. Scans from 35 to 356 mils in automatic scan.

b. Transmitting System.

Transmitter type	Tunable S-band magnetron
Transmitter frequency	3,100 to 3,500 mc
Magnetron current	30 ma
Range	250,000 yds
Type of modulation	Pulse
Power output	1 megw peak, 625w average
Modulator type	Line type soft tube modulator
Pulse repetition rate	500 pps

c. Presentation System.

PPI	On battery control console: Ten-inch cathode-ray tube with electro-static deflection; continuous display in range and azimuth of area surrounding the LOPAR system. Coverage is 6,400 mils in azimuth and 50,000, 150,000, 250,000, and 350,000 yards in range; provision for expanded presentation of any 1245-mil azimuth sector.
Precision indicator	On battery control console: five-inch cathode-ray tube with electromagnetic deflection; modified B-type presentation displaying a section of the PPI display 25,000 yards in range and 533 mils in azimuth, centered about the intersection of the acquisition (flashing) azimuth line and acquisition range circle.
B scope indicator	On target radar control console: Ten-inch cathode-ray tube with electrostatic deflection; modified B-type presentation displaying a sector of PPI display 220,000 yards in range and 1,066 mils in azimuth.

68 (U). HIPAR System Operating Data

For the operating data of the HIPAR system, refer to TM 9-1430-253-12/3.

68.1 (C). AAR System Operating Data

a. Range:

Maximum	350,000 yards
Minimum	600 yards
b. Azimuth	continuous 6,400 mils at 6 rpm clockwise
c. Peak RF power output	500 kilowatts

69 (C). FUIF System Operating Data

a. Power equipment	3-phase, 208-volt, 400-cps
b. Range	Determined by distance from integrated system to AADCP

c. Inputs to FUIF from AADCP

(1) Type signal	600-cps and 1,500-cps pulse code modulation (by wire)
(2) Type information	Friend Foe Battery engagement Remote Hold fire Cease fire

d. Outputs from FUIF to AADCP

(1) Type signal	600-cps and 1,500-cps pulse code modulation (by wire)
(2) Type information	Foe Target tracked One Few Many Fire Effective Ineffective Kill Local Acknowledge Out of action X and Y coordinates of tracked target Validity

70 (C). Target Tracking, Target Ranging, and Missile Tracking Radar Systems

a. TTR System.

(1) *Antenna system.*

Azimuth limits of operation	0 to 6,400 mils continuous
Elevation limits of operation	−195 to 1,550 mils (max)

(2) *Transmitter system.*

Transmitter type	Tunable magnetron
Magnetron frequency	8,500 to 9,600 mc
Magnetron current	Midscale reading
Range	200,000 yds

(3) *Limits of operation.*

Tracking rates:	
Range	2,000 yds per second
Azimuth	700 mils per second
Elevation	700 mils per second
Slewing rates:	
Range	18,000 yds per second
Elevation	65 mils per second

(4) *Modes of operation.*

Manual, acquire-aided, track-aided, and automatic

Section VIII (C). OPERATING DATA

65 (U). General

This section contains operating data pertaining to the RCDC. Paragraph 66 contains overall operating data. Paragraphs 67 through 73 contain data pertinent to major components of the system.

66 (C). Overall Operating Data

a. Primary Power Requirements.

(1) *400-cycle requirements.* The 400-cycle power requirements are given below.

Trailer mounted director station	18.5 kw
Trailer mounted tracking station	34.0 kw
FUIF equipment	4.0 kw
Total	56.5 kw

(2) *60-cycle requirements.* The 60-cycle power requirements for selected temperature zones [1], which differ between consolidated and nonconsolidated site, are given below.

Item	Consolidated	Nonconsolidated
HIPAR system	205.0 kw	205.0 kw
HIPAR building (air conditioners, heating, and lights, including FUIF room in consolidated site)		
+20° C zone	122.2 kw	78.0 kw
0° C zone	133.2 kw	84.0 kw
−20° C zone	146.2 kw	93.0 kw
Electronic shop building		
+20° C zone	-------	60.8 kw
0° C zone	-------	66.3 kw
−20° C zone	-------	71.3 kw
Power building (heating, lights, ventilating fans, and battery charger)		
+20° C zone	44.3 kw	44.3 kw
0° C zone	50.5 kw	50.6 kw
−20° C zone	60.0 kw	61.0 kw
400-cycle motor alternators	70.0 kw	70.0 kw
Administrative base load [2]	75.0 kw	75.0 kw
Totals		
+20° C zone	516.5 kw	533.1 kw
0° C zone	533.7 kw	550.9 kw
−20° C zone	556.2 kw	575.3 kw

[1] Temperatures specified were chosen only to indicate the difference in power requirements as the temperature changes.

[2] This is optional when operating from engine alternator power.

b. System Warmup Time Requirements.[3]

HIPAR system	15 minutes
LOPAR system	5 minutes
TTR and MTR systems	5 minutes
TRR system	5 minutes
Computer system	30 seconds

67 (C). LOPAR System Operating Data

a. Antenna System.

Antenna elevation angle	Variable from 35.5 to 391 mils
Antenna azimuth beam width	25 mils
Azimuth coverage	Continuous through 6,400 mils
Antenna rotational speed	5, 10, or 15 rpm
Antenna azimuth drive	3-speed, 400-cps, 3-phase motor
Elevation scan rate	40 seconds (up and down from 35 to 391 mils)
Pencil beam range	250,000 yards
Cosecant squared beam range	175,000 yards
Accuracy	±150 yards in range, 18 mils in azimuth
Scan condition 1	Pencil beam at 35 mils elevation; beam changing from pencil beam to cosecant squared beam between 35 and 107 mils; cosecant squared beam from 107 to 391 mils. Scans from 35 to 391 mils in automatic scan.
Scan condition 2	Pencil beam from 35 to 107 mils elevation; beam changing from pencil beam to cosecant squared beam between 107 and 178 mils; cosecant squared beam from 178 to 391 mils. Scans from 35 to 231 mils in automatic scan.
Scan condition 3	Pencil beam from 35 to 178 mils elevation; beam changing from pencil beam to cosecant squared beam between 178 and 249 mils; cosecant squared beam from 249 to 391 mils. Scans from 35 to 303 mils in automatic scan.
Scan condition 4	Pencil beam from 35 to 149 mils elevation; beam changing from pencil beam to cosecant squared beam between 249 and 320 mils; cosecant squared beam from 320 to 391 mils. Scans from 35 to 391 mils in automatic scan.

[3] Ideal warmup time for each system is 30 minutes.

b. Transmitting System.

Transmitter type	Tunable S-band magnetron
Transmitter frequency	3,100 to 3,500 mc
Magnetron current	30 ma
Range	250,000 yds
Type of modulation	Pulse
Power output	1 megw peak, 625w average
Modulator type	Line type soft tube modulator
Pulse repetition rate	500 pps

c. Presentation System.

PPI	On battery control console: Ten-inch cathode-ray tube with electro-static deflection; continuous display in range and azimuth of area surrounding the LOPAR system. Coverage is 6,400 mils in azimuth and 50,000, 150,000, 250,000, and 350,000 yards in range; provision for expanded presentation of any 1245-mil azimuth sector.
Precision indicator	On battery control console: five-inch cathode-ray tube with electromagnetic deflection; modified B-type presentation displaying a section of the PPI display 25,000 yards in range and 533 mils in azimuth, centered about the intersection of the acquisition (flashing) azimuth line and acquisition range circle.
B scope indicator	On target radar control console: Ten-inch cathode-ray tube with electrostatic deflection; modified B-type presentation displaying a sector of PPI display 220,000 yards in range and 1,066 mils in azimuth.

68 (U). HIPAR System Operating Data

For the operating data of the HIPAR system, refer to TM 9-1430-253-12/3.

68.1 (C). AAR System Operating Data

a. Range:

Maximum	350,000 yards
Minimum	600 yards
b. Azimuth	continuous 6,400 mils at 6 rpm clockwise
c. Peak RF power output	500 kilowatts

69 (C). FUIF System Operating Data

a. Power equipment	3-phase, 208-volt, 400-cps
b. Range	Determined by distance from integrated system to AADCP

c. Inputs to FUIF from AADCP

(1) Type signal	600-cps and 1,500-cps pulse code modulation (by wire)
(2) Type information	Friend Foe Battery engagement Remote Hold fire Cease fire

d. Outputs from FUIF to AADCP

(1) Type signal	600-cps and 1,500-cps pulse code modulation (by wire)
(2) Type information	Foe Target tracked One Few Many Fire Effective Ineffective Kill Local Acknowledge Out of action X and Y coordinates of tracked target Validity

70 (C). Target Tracking, Target Ranging, and Missile Tracking Radar Systems

a. TTR System.

(1) *Antenna system.*

Azimuth limits of operation	0 to 6,400 mils continuous
Elevation limits of operation	−195 to 1,550 mils (max)

(2) *Transmitter system.*

Transmitter type	Tunable magnetron
Magnetron frequency	8,500 to 9,600 mc
Magnetron current	Midscale reading
Range	200,000 yds

(3) *Limits of operation.*

Tracking rates:

Range	2,000 yds per second
Azimuth	700 mils per second
Elevation	700 mils per second

Slewing rates:

Range	18,000 yds per second
Elevation	65 mils per second

(4) *Modes of operation.*

Manual, acquire-aided, track-aided, and automatic

b. TRR System.

(1) *Antenna system.*

Azimuth limits of operation ...... Controlled by TTR

Elevation limits of operation ...... Controlled by TTR

(2) *Transmitter system.*

Transmitter type Tunable magnetron (2)

Magnetron frequency ...... 15,700 to 17,500 mc

Magnetron current ...... Midscale reading

Range ...... 200,000 yds

(3) *Limits of operation.*

Tracking rates:

Range ...... 2,000 yds per second

Azimuth ...... 700 mils per second

Elevation ...... 700 mils per second

Slewing rates:

Range ...... 18,000 yds per second

Elevation ...... 65 mils per second

(4) *Modes of operation.*

Manual, acquire-aided, track-aided, and automatic

c. MTR System.

(1) *Antenna system.*

Azimuth limits of operation ...... 0 to 6,400 mils continuous

Elevation limits of operation ...... −195 to 1,550 mils

(2) *Transmitter system.*

Transmitter type Tunable magnetron

Magnetron frequency ...... 8,500 to 9,600 mc

Magnetron current:

NIKE-HERCULES missile ...... 8.5 ma

NIKE-AJAX missile ...... 15 ma

Range:

When tracking NIKE-HERCULES missile ...... 200,000 yds

When tracking NIKE-AJAX missile ...... 55,000 yds

(3) *Limits of operation.*

Tracking rates:

Range ...... 1,600 yds per second

Azimuth ...... 750 mils per second

Elevation ...... 700 mils per second

Slewing rates:

Range ...... 18,000 yds per second

(4) *Modes of operation.*

Manual, aided, and automatic

71 (C). Computer System Operating Data

a. Overall System Data.

Type ...... DC analog

Inputs ...... Slant range, azimuth, and elevation of target; slant range, azimuth and elevation of missile. Manually set in radar-to-radar parallax, launcher-to-radar parallax, burst time bias, and height of site. Final dive time and height displacement manually set in during a surface-to-surface mission only. Minimum burst altitude used in nuclear warhead missions.

Outputs ...... Roll amount gyro preset information (A_G) G_Y and G_P orders and burst order. Data to recorder group and to plotting boards.

b. System Operational Data Limits.

Settling time ...... 4 seconds

Time to intercept ...... 0 to 200 seconds

Climb angle ...... 0 to 6,400 mils continuous (0 to 1,500 tactical)

Turn angle ...... −1,260 to +1,260 mils

Ballistic elevation angle ...... −1,600 to +1,600 mils

Gyro azimuth ...... 0 to 6,400 mils continuous

G_Y and G_P orders ...... Maximum limits: for NIKE-HERCULES, −7G and +7G for each elevon axis; for NIKE-AJAX, −5G and + 5G for each fin axis.

Maximum combined effect is: for NIKE-HERCULES, −7G and +7G; for NIKE-AJAX, −7G and +7G.

Radar-to-radar parallax ...... −165 to +165 yds in each rectangular coordinate

Launcher-to-radar parallax ...... −6,000 to +6,000 yds in each rectangular coordinate

Burst time bias ...... 0 to 200 ms

Height of site ...... 0 to 6,000 ft

Height displacement ...... 0 to 100,000 ft

Final dive time ...... 0 to 25 seconds

Maximum ballistic computer rates:

Time-to-intercept computer	30 seconds per second slewing for NIKE-HERCULES 15 seconds per second slewing for NIKE-AJAX 4 seconds per second tracking
Climb and turn computer:	
Climb angle	660 mils per second
Turn angle	660 mils per second
A_0, B, and T_D computer:	
Ballistic elevation	850 mils per second
Gyro azimuth	850 mils per second
Dead time	7 seconds
Velocity correction servo:	
Correction	0 to 50 percent
Transit time servo:	
Transit time	0 to 16 seconds
Minimum burst altitude	0 to 10,000 ft
Target velocity	0 to 600 yds per second in each rectangular coordinate

72 (U). Multichannel Data Recorder Operating Data

Maximum number of channels	24 (16 in use)
Recording method	Mirror galvanometers
Recording medium	Light sensitive recording paper on roll 200 ft lg, 1 ft wide
Maximum recording period	200 minutes
Paper footage indication	Automatic footage indicator and associated indicator light. Light illuminates when 25 ft of paper remain.
Chart speed	1 ft per minute (0.2 in. per second)

73 (U). Heating System, Cooling System, and Trailer Lighting System Operating Data

a. Heating System.

(1) *Consolidated sites.*

HIPAR building	13,600 cubic ft per minute of heated air when maximum circulation is required. Heat is circulated through ducts which also serve for air conditioning.
Trailer mounted director and tracking stations	Each trailer receives a maximum of 1,390 cubic ft per minute of heated air from the HIPAR building heating equipment.
FUIF room	The FUIF room receives a maximum of 1,220 cubic ft per minute of heated air from the HIPAR building heating equipment.

(2) *Nonconsolidated sites with* HIPAR.

HIPAR building	9,600 cubic ft per minute of heated air when maximum circulation is required. Heat is circulated through ducts which also serve for air conditioning.
Trailer mounted director and tracking stations	Each trailer receives a maximum of 1,390 cubic ft per minute of heated air from the electronic shop building heating equipment.
FUIF room	The FUIF room receives a maximum of 1,220 cubic ft per minute of heated air from the electronic shop building equipment.

b. Cooling System.

(1) *Consolidated sites.*

HIPAR building	13,600 cubic ft per minute of cooled air when maximum circulation is required. Cooled air is circulated through ducts.
Trailer mounted director and tracking stations	Each trailer receives a maximum of 1,390 cubic ft per minute of cooled air from the air conditioner in the HIPAR building.
FUIF room	Operates from air conditioner within FUIF room or receives cooled air from the HIPAR

building air conditioning equipment.

(2) *Nonconsolidated sites with* HIPAR.

HIPAR building	9,600 cubic ft per minute when maximum circulation is required. Cooled air is circulated through ducts in the building.
Trailer mounted director and tracking stations	Each trailer receives a maximum of 1,390 cubic ft per minute of cooled air from the air conditioner in the electronic shop building.
FUIF room	The FUIF room receives a maximum of 1,220 cubic ft per minute of cooled air from the air conditioner in the electronic shop building.

c. Trailer Lighting System.

General illumination	White incandescent
Blackout	Blue incandescent
Emergency	White incandescent
Instrument panels	Blacklight lights with fluorescent panel markings

CONFIDENTIAL

CONFIDENTIAL

CHAPTER 4 (U)

EQUIPMENT SERVICEABILITY CRITERIA

74 (U). General

This chapter contains the equipment criteria for the RCDC. Equipment serviceability criteria are furnished to users to enable them to determine whether their equipment can perform its primary mission. The commander is required to evaluate the equipment using these criteria. As a result of this evaluation, he will rate the equipment in one of two categories:

a. Green. Combat equipment free of any condition limiting the reliable performance of its primary mission.

b. Red. Combat equipment that is unable to perform its primary mission immediately or equipment which is unreliable.

75 (U). Evaluation

Evaluation of the RCDC is determined by user personnel while performing the operational check procedures contained in TM 9–1430–250–12/2, TM 9–1430–251–12, and TM 9–1430–252–12/3.

76 (U). Records

Record the results of the evaluation on DA Form 2404 in accordance with the instructions contained in TM 38–750 and AR 750–10.

CHAPTER 5 (C)

FRONT PANEL CONTROLS AND INDICATORS FOR THE RADAR COURSE DIRECTING CENTRAL

Section I (C). TRAILER MOUNTED DIRECTOR STATION

77 (U). Trailer Lighting and Miscellaneous Equipment, Trailer Heating Equipment, and Equipment Cooling System

a. Trailer Lighting and Miscellaneous Equipment. The controls of the trailer lighting and miscellaneous equipment for the trailer mounted director station are on the trailer door light panel, tactical control-indicator, battery control console, trailer ceiling, and entrance door frame. The nonplacarded controls are shown on figure 50, and all controls are described in table 1.

Table 1 (U). Trailer Mounted Director Station—Trailer Lighting Equipment and Miscellaneous Equipment—Controls (U)

Control or indicator	Appar des	Type	Function	Key to fig. 50
Blacklight fixture with switch (6)		Pushbutton	When depressed, controls fluorescent blacklight in associated blacklight fixture.	1
BLACKOUT OVERRIDE switch	S5	Toggle (two-position)	When set to OFF, all white incandescent ceiling lights extinguish and all blue blackout ceiling lights illuminate when trailer mounted director station door is opened. When set to on (up) position, all white incandescent ceiling lights and blue blackout ceiling lights are not affected by opening and closing the trailer mounted director station door.	
CEILING LIGHTS switch	S5	Toggle (two-position)	When set to ON, illuminates all white incandescent ceiling lights at full intensity. When set to REMOTE, control of all but two of the white incandescent ceiling lights is transferred to the CEILING LIGHTS switch and CEILING LIGHTS knob on the tactical control-indicator. The two white ceiling lights not controlled remotely are located, one in the third incandescent light fixture from the rear of the trailer mounted director station, and one in the fifth incandescent light fixture. These two lights are operated from the emergency 24-volt circuit.	
CEILING LIGHTS switch	S10	Toggle (two-position)	When set to BRIGHT, illuminates all white incandescent ceiling lights at full brilliance provided the CEILING LIGHTS switch on the trailer door light panel is set to REMOTE. When set to DIM, permits brilliance of all white incandescent ceiling lights to be controlled by the CEILING LIGHTS knob on the tactical control-indicator provided the CEILING LIGHTS switch on the trailer door light panel is set to REMOTE.	

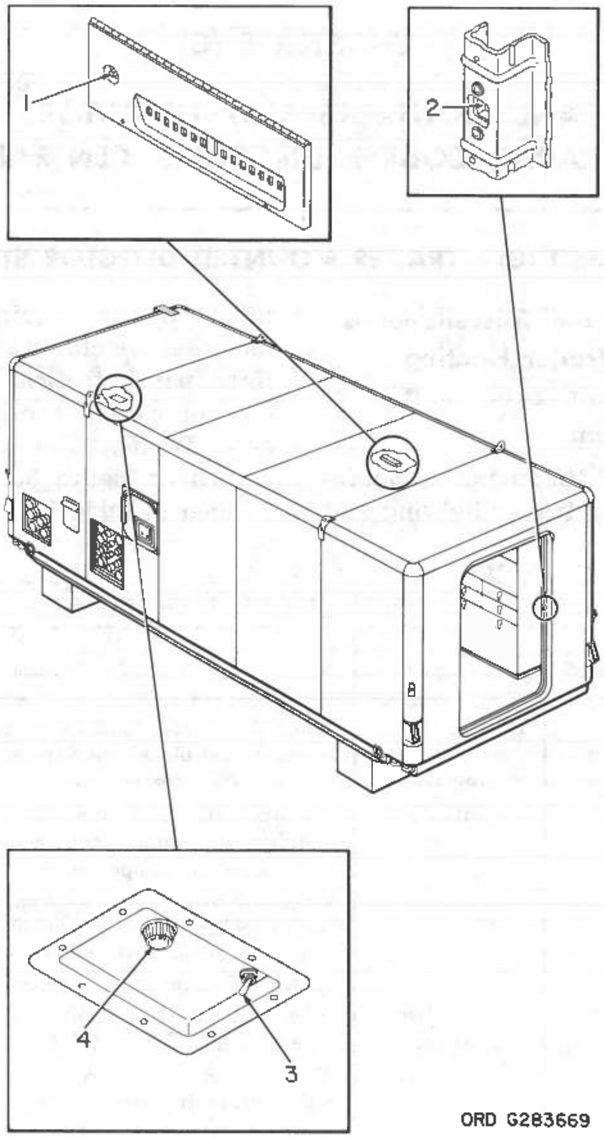


Figure 50 (U). Trailer mounted director station—trailer lighting equipment—nonplacarded controls (U).

Table 1 (U). Trailer Mounted Director Station—Trailer Lighting Equipment and Miscellaneous Equipment—Controls—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 50
CEILING LIGHTS variable transformer	T3	Rotary (knob adjust)	When turned, adjusts the brilliance of all white incandescent ceiling lights provided the CEILING LIGHTS switch on the tactical control-indicator is set to DIM, and the CEILING LIGHTS switch on the trailer door light panel is set to REMOTE.	
Early warning plotting board light switch	S10	Toggle (two-position)	When set to ON, the two early warning plotting board lights illuminate.	3

Table 1 (U). Trailer Mounted Director Station—Trailer Lighting Equipment and Miscellaneous Equipment—Controls—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 50
Early warning plotting board light variable resistor	R1	Rotary (knob adjust)	When rotated ccw, varies illumination of the early warning plotting board lights provided the early warning plotting board light switch is set to ON.	4
ENTRANCE LIGHT OVERRIDE switch	S6	Toggle (two-position, with guard)	When set to the on (right) position, controls white incandescent light in the first incandescent light fixture from entrance of trailer mounted director station provided all other white incandescent lights are illuminated.	
SAFETY OFFICER BURST indicator light	I20	Red	When illuminated, indicates burst order has been issued.	
SAFETY OFFICER BURST switch	S9	Toggle (two-position)	When operated, causes computer to issue burst order.	
Trailer door interlock switch	S4	Microswitch	Operates when trailer mounted director station door is opened causing all white incandescent ceiling lights to extinguish and all blue blackout ceiling lights to illuminate provided BLACKOUT OVERRIDE switch is set to OFF.	2

b. Trailer Heating Equipment. The controls and indicators of the trailer heating equipment for the trailer mounted director station are on the front panel and in the upper utility compartment (2, fig. 24) of the personnel heater (17, fig. 16). The nonplacarded controls and indicators are shown on figure 24. All controls and indicators for NIKE-HERCULES Systems 1087 and above are described in table 2. All controls and indicators for NIKE-HERCULES Systems 1086 and below are described in table 3.

Table 2 (U). Personnel Heater—Trailer Heating Equipment—Systems 1087 and Above —Controls and Indicators (U)

Control or indicator	Appar des	Type	Function	Key to fig. 24
AMMETER	M1	DC	Monitors charging or discharging current of the 24-volt storage batteries.	
BATTERY CHARGER fuse indicator lights	I1 and I2	Red	When illuminated, indicates associated fuse has blown.	
Blower discharge damper control	S1	Lever	When set to HEAT, prepares ignition system and fuel pump for operation and directs ventilating air down through heater. When set to COOL, disables ignition and fuel pump from operation, and directs ventilating air up and through ceiling duct.	3
Blower intake damper control	S1	Lever	When set to 1 FRESH AIR, fresh air port is opened and return air duct is closed to permit only fresh air to be delivered to ventilating blower fan. When set to 7 RECIRCULATE, fresh air port is closed and return air duct is opened to permit only air from return air duct to be delivered to ventilating blower fan. When set to one of the intermediate positions, fresh air and air from return air duct are delivered to ventilation blower fan in proportional amounts depending on the position of the lever.	11

Table 2 (U). Personnel Heater—Trailer Heating Equipment—Systems 1087 and Above —Controls and Indicators—Continued (U)

Control or indicator	Appar des	Type	Function	Key to fig. 24
COMBUSTION BLOWER fuse indicator light	I4	Red	When illuminated, indicates associated fuse has blown.	
HEATER fuse indicator light	I3	Red	When illuminated, indicates associated fuse has blown.	
HEATER indicator light	I5	White	When illuminated, indicates heater is energized for operation.	
HEATER switch	S1	Toggle (three-position)	When set to ON, energizes heater for operation. When set to VENT, energizes ventilating air blower for direct operation.	
LIGHTS fuse indicator light	I4	Red	When illuminated, indicates associated fuse has blown.	
NORMAL VENT BLOWER fuse indicator lights	I1, I2, and I3	Red	When illuminated, indicates associated fuse has blown.	
RESET indicator light	I6	Red	When illuminated, indicates internal time delay relay is energized to stop heater because of combustion failure.	
RESET switch	S2	Pushbutton	When depressed, resets internal time delay switch to restore heater for operation.	
SIREN fuse indicator light	I5	Red	When illuminated, indicates associated fuse has blown. (Not used in the trailer mounted tracking station.)	

Table 3 (U). Personnel Heater—Trailer Heating Equipment—Systems 1086 and Below —Controls and Indicators (U)

Control or indicator	Appar des	Type	Function	Key to fig. 24
AMMETER	M1		Monitors the charging or discharging current of the 24-volt storage batteries.	
BATTERY CHARGER fuse indicator light	I4	Red	When illuminated, indicates the associated fuse has blown.	
COMBUSTION BLOWER fuse indicator light	I5	Red	When illuminated, indicates associated fuse has blown.	
Blower discharge damper control	S1	Lever	When set to HEAT, prepares ignition system and fuel pump for operation and directs ventilating air down through heater. When set to COOL, disables ignition system and fuel pump, and directs ventilating air up and through ceiling duct.	3
Blower intake damper control	S1	Lever	When set to No. 1 FRESH AIR, opens fresh air port and closes return air duct to permit only fresh air to be delivered to ventilation blower motors. When set to No. 7 RECIRCULATE, closes fresh air duct and opens return air duct to permit only air from the return air duct to be delivered to ventilation blower motors. When set to one of the intermediate positions, delivers fresh air and air from return air duct to ventilation blower motors in proportional amounts, depending on the position of the lever.	11

Table 3 (U). Personnel Heater—Trailer Heating Equipment—Systems 1086 and Below —Controls and Indicators—Continued (*U*)

Control or indicator	Appar des	Type	Function	Key to fig. 24
EMERGENCY BLOWER fuse indicator light	I2	Red	When illuminated, indicates the associated fuse has blown.	
EMERGENCY LIGHTS fuse indicator light	I3	Red	When illuminated, indicates the associated fuse has blown.	
EMERGENCY VENT BLOWER indicator light	I1	Red	When illuminated, indicates emergency ventilation blower motor has been energized for operation.	
EMERGENCY VENT BLOWER switch	S1	Toggle (two-position)	When set to ON, applies 24 volts from storage batteries to the emergency ventilation blower motor.	
HEATER fuse indicator light	I1	Red	When illuminated, indicates associated fuse has blown.	
HEATER indicator light	I3	White	When illuminated, indicates heater is energized for continuous fuel mixture and combustion.	
HEATER switch	S4	Toggle (three-position)	When set to START, energizes heater to establish initial fuel mixture supply and combustion. When set to RUN, energizes heater to retain fuel mixture supply and combustion for providing burning gases to heat exchanger.	
IGNITION fuse indicator light	I9	Red	When illuminated, indicates the associated fuse has blown.	
NORMAL VENT BLOWER indicator light	I2	White	When illuminated, indicates normal ventilation blower motor has been energized for operation.	
NORMAL VENT BLOWER fuse indicator lights	I6, I7, and I8	Red	When illuminated, indicates the associated fuse has blown.	
NORMAL VENT BLOWER switch	S2	Toggle (two-position)	When set to ON, applies 208-volt, 3-phase, 400-cycle power to normal ventilation blower.	
OUTPUT switch	S3	Toggle (two-position)	When set to LOW, conditions the normal ventilation blower motor for half-speed operation. When set to HIGH, conditions the normal ventilation blower motor for full-speed operation.	
PRIME indicator light	I4	Red	When illuminated, indicates fuel pump is energized to supply fuel to heater for initial combustion.	
PRIME switch	S5	Toggle (two-position, spring-loaded to down)	When set to ON, energizes fuel pump to supply fuel to heater until flame switch is heated and HEATER switch is set to RUN.	

c. Equipment Cooling Systems. The controls and indicators of the equipment cooling system for the trailer mounted director station are in the upper equipment cooling cabinet compartment of the utility cabinet (3, fig. 26). The nonplacarded controls and indicators are shown on figure 26, and all controls and indicators are described in table 4.

Table 4 (U). Utility Cabinet—Equipment Cooling System—Controls and Indicators (U)

Control or indicator	Appar des	Type	Function	Key to fig. 26
Alarm buzzer silence switch	S1	Toggle (two-position, spring-loaded to up)	When operated to the on (up) position, silences the overheat alarm buzzer.	13
Damper and shutter lever		Five-position	Controls air intake and exhaust of the equipment cooling system. Lever may be operated from CLOSED (pushed in) to OPEN (pulled out) in increments of one quarter.	11
EXHAUST TEMPERATURE meter			Indicates temperature of exhaust air from −20° to +180° F in increments of 5°.	
OPERATING INSTRUCTIONS plate			Provides instructions for operation of equipment cooling system, covering damper settings, filter replacements, and alarms.	
System overheated indicator light	I1	Red	Illuminates when the temperature of the cooling air has reached 140° F. Extinguishes when temperature drops below 130° F.	12

78 (U). SIF/IFF Video Decoder MX-1995/TPA-3

The controls and indicators of the SIF/IFF video decoder on the video decoder sliding frame (7, fig. 26) in the equipment cooling cabinet are described in table 5.

Table 5 (U). SIF/IFF Video Decoder—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
POWER indicator light	DS201	Clear (with dimmer)	When illuminated, indicates that 110-volt, 400-cycle, ac power is applied to the video decoder.
POWER switch	S201	Toggle (two-position)	When set to ON, applies single-phase, 110-volt, 400-cycle, ac power to the video decoder and illuminates POWER PILOT indicator light.

79 (U). Director Station Group

The controls and indicators of the director station group (18, fig. 16) are on the acquisition power control panel (1, fig. 25) and are described in table 6.

Table 6 (U). Acquisition Power Control Panel—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
ACQ HIGH VOLTS fuse indicator lights	DS37, DS38, and DS39	Red	When illuminated, indicates associated fuse has blown.
ACQ POWER fuse indicator lights	DS17, DS18, and DS19	Red	When illuminated, indicates associated fuse has blown.
ADJUST PHASE C knob	R1	Rotary	When turned, adjusts the magnitude of phase C input line voltage as indicated on LINE VOLTS meter.
ANT BLOWER fuse indicator lights	DS26, DS27, and DS28	Red	When illuminated, indicates associated fuse has blown.
AZIMUTH DRIVE MOTOR fuse indicator lights	DS23, DS24, and DS25	Red	When illuminated, indicates associated fuse has blown.

Table 6 (U). Acquisition Power Control Panel—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
BARBETTE AC POWER switch	S6	Toggle (two-position, heavy-duty)	When set to ON, performs the functions listed in *a* through *d* below. *a.* Applies ac voltage to the azimuth drive motors and the antenna blowers in the barbette of the LOPAR system. *b.* Applies filament voltage to the magnetron of the LOPAR system. *c.* Illuminates HIGH VOLTS—PREHEAT indicator light within 5 seconds. *d.* Illuminates HIGH VOLTS—HOT indicator light after 5 minutes, provided BARBETTE DC switch is set to ON.
BARBETTE DC indicator light	DS43	White	When illuminated, indicates that the BARBETTE DC switch is set to ON and dc voltage is applied to the barbette of the LOPAR system. HV SUPPLY READY indicator light on LOPAR auxiliary control-indicator illuminates (white) provided delay timers have clocked down.
BARBETTE DC switch	S12	Toggle (two-position)	When set to ON, performs the functions listed in *a* through *d* below. *a.* Applies dc voltage to the barbett of the LOPAR system provided the interlocks and PLATE VOLTS switch are closed. *b.* Illuminates AFC HUNT indicator light on the LOPAR control-indicator. *c.* Illuminates BARBETTE DC indicator light. *d.* Illuminates HIGH VOLTS—READY and HV SUPPLY-READY indicator lights provided 5-minute delay time has expired.
BATTLE SHORT switch	S1	Toggle (two-position, with guard)	When set to the on (up) position, the interlock circuits and delay timers in the LOPAR system are bypassed.
+1550v fuse indicator lights	DS40, DS41, and DS42	Red	When illuminated, indicates associated fuse has blown provided indicator high voltage has been applied.
BLK LIGHT fuse indicator light	DS2	Red	When illuminated, indicates associated fuse has blown.
BTE POWER fuse indicator light	DS45	Red	When illuminated, indicates fuse has blown.
BTE POWER ON indicator light	DS44	White	When illuminated, indicates power is applied to the AN/GSA-77 BTE.
EQPT VENT fuse indicator lights	DS6, DS7, and DS8	Red	When illuminated, indicates associated fuse has blown provided EQPT VENT switch is set to on (up) position.
FILAMENTS—ACQ fuse indicator light	DS9	Red	When illuminated, indicates associated fuse has blown.
FILAMENTS—CONSOLE fuse indicator light	DS10	Red	When illuminated, indicates associated fuse has blown.
HIGH VOLTS—HOT indicator light	DS34	Amber	When illuminated, indicates filaments of the high-voltage circuits of the LOPAR transmitter system are hot.
HIGH VOLTS—ON indicator light	DS36	Red	When illuminated, indicates high voltage is applied to the LOPAR transmitter system.

Table 6 (U). Acquisition Power Control Panel—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
HIGH VOLTS—PREHEAT indicator light	DS33	White	When illuminated, indicates filament voltage is applied to the magnetron of the LOPAR system.
HIGH VOLTS—READY indicator light	DS35	Green	When illuminated, indicates high voltage may be applied to the LOPAR transmitter system.
INTLK indicator light	DS30	Amber	When illuminated, indicates that LOPAR system interlock circuit is closed. When extinguished, indicates interlock circuit is open or that high voltage is applied to the LOPAR transmitter system.
INTLK OVERRIDE switch	S10	Toggle (two-position, spring-loaded to left)	When set to ON, all interlock switches of the director station group, battery control console (except lower right door) and trailer mounted director station of the LOPAR low-voltage system are bypassed. The timer interlocks are not overridden.
LINE VOLTS meter	M2		Indicates the magnitude of each phase of the three-phase input line voltage as selected by the position of the PHASE switch. Scale is stamped from 0 to 150 volts, graduated from 30 to 150 volts in increments of 5 volts.
MAIN POWER switch	S4	Toggle (two-position, heavy-duty)	When set to ON, performs the functions listed in *a* through *e* below. *a.* Makes three-phase power available to the LOPAR and computer systems. *b.* Supplies power to the recorder group, personnel heater, equipment cooling cabinet, trailer lighting equipment, and 110-volt ac outlets in trailer mounted director station. *c.* Supplies power to personnel heater, trailer lighting equipment, and 110-volt ac outlets in trailer mounted tracking station. *d.* Supplies power to the 110-volt ac outlets on the acquisition receiver-transmitter of the LOPAR system. *e.* Illuminates all ivory tactical control-indicator lights in the trailer mounted director station and trailer mounted tracking station.
PHASE switch	S8	Rotary (three-position)	Determines which phase (A, B, or C) of line voltage is monitored on the LINE VOLTS meter.
PLATE VOLTS—ON indicator light	DS32	White	When illuminated, indicates plate voltage is applied to all circuits of the LOPAR system except the high voltage circuits.
PLATE VOLTS—READY indicator light	DS31	Amber	When illuminated, indicates that plate voltage may be applied to all circuits of the LOPAR system except the LOPAR transmitter circuits.
PLATE VOLTS switch	S9	Toggle (two-position)	When set to on (up) position, applies plate voltage to presentation circuits and units in the director station group. Illuminates PLATE VOLTS—ON indicator light and extinguishes PLATE VOLTS—READY indicator light.
PRESENTATION POWER switch	S5	Toggle (two-position, heavy-duty)	When set to ON, performs the functions listed in *a* through *d* below. *a.* Applies ac power to the presentation system of the trailer mounted director station. *b.* Applies filament voltage to the battery control console and to the power supplies of the director station group. *c.* Illuminates INTLK indicator light immediately. *d.* Illuminates PLATE VOLTS—READY indicator light in 20 to 30 seconds.

Table 6 (U). Acquisition Power Control Panel—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
BARBETTE AC POWER switch	S6	Toggle (two-position, heavy-duty)	When set to ON, performs the functions listed in *a* through *d* below. *a.* Applies ac voltage to the azimuth drive motors and the antenna blowers in the barbette of the LOPAR system. *b.* Applies filament voltage to the magnetron of the LOPAR system. *c.* Illuminates HIGH VOLTS—PREHEAT indicator light within 5 seconds. *d.* Illuminates HIGH VOLTS—HOT indicator light after 5 minutes, provided BARBETTE DC switch is set to ON.
BARBETTE DC indicator light	DS43	White	When illuminated, indicates that the BARBETTE DC switch is set to ON and dc voltage is applied to the barbette of the LOPAR system. HV SUPPLY READY indicator light on LOPAR auxiliary control-indicator illuminates (white) provided delay timers have clocked down.
BARBETTE DC switch	S12	Toggle (two-position)	When set to ON, performs the functions listed in *a* through *d* below. *a.* Applies dc voltage to the barbett of the LOPAR system provided the interlocks and PLATE VOLTS switch are closed. *b.* Illuminates AFC HUNT indicator light on the LOPAR control-indicator. *c.* Illuminates BARBETTE DC indicator light. *d.* Illuminates HIGH VOLTS—READY and HV SUPPLY-READY indicator lights provided 5-minute delay time has expired.
BATTLE SHORT switch	S1	Toggle (two-position, with guard)	When set to the on (up) position, the interlock circuits and delay timers in the LOPAR system are bypassed.
+1550v fuse indicator lights	DS40, DS41, and DS42	Red	When illuminated, indicates associated fuse has blown provided indicator high voltage has been applied.
BLK LIGHT fuse indicator light	DS2	Red	When illuminated, indicates associated fuse has blown.
EQPT VENT fuse indicator lights	DS6, DS7, and DS8	Red	When illuminated, indicates associated fuse has blown provided EQPT VENT switch is set to on (up) position.
FILAMENTS—ACQ fuse indicator light	DS9	Red	When illuminated, indicates associated fuse has blown.
FILAMENTS—CONSOLE fuse indicator light	DS10	Red	When illuminated, indicates associated fuse has blown.
HIGH VOLTS—HOT indicator light	DS34	Amber	When illuminated, indicates filaments of the high-voltage circuits of the LOPAR transmitter system are hot.
HIGH VOLTS—ON indicator light	DS36	Red	When illuminated, indicates high voltage is applied to the LOPAR transmitter system.
HIGH VOLTS—PREHEAT indicator light	DS33	White	When illuminated, indicates filament voltage is applied to the magnetron of the LOPAR system.
HIGH VOLTS—READY indicator light	DS35	Green	When illuminated, indicates high voltage may be applied to the LOPAR transmitter system.

Table 6 (U). Acquisition Power Control Panel—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
INTLK indicator light	DS30	Amber	When illuminated, indicates that LOPAR system interlock circuit is closed. When extinguished, indicates interlock circuit is open or that high voltage is applied to the LOPAR transmitter system.
INTLK OVERRIDE switch	S10	Toggle (two-position, spring-loaded to left)	When set to ON, all interlock switches of the director station group, battery control console (except lower right door) and trailer mounted director station of the LOPAR low-voltage system are bypassed. The timer interlocks are not overridden.
LINE VOLTS meter	M2		Indicates the magnitude of each phase of the three-phase input line voltage as selected by the position of the PHASE switch. Scale is stamped from 0 to 150 volts, graduated from 30 to 150 volts in increments of 5 volts.
MAIN POWER switch	S4	Toggle (two-position, heavy-duty)	When set to ON, performs the functions listed in *a* through *e* below. *a.* Makes three-phase power available to the LOPAR and computer systems. *b.* Supplies power to the recorder group, personnel heater, equipment cooling cabinet, trailer lighting equipment, and 110-volt ac outlets in trailer mounted director station. *c.* Supplies power to personnel heater, trailer lighting equipment, and 110-volt ac outlets in trailer mounted tracking station. *d.* Supplies power to the 110-volt ac outlets on the acquisition receiver-transmitter of the LOPAR system. *e.* Illuminates all ivory tactical control-indicator lights in the trailer mounted director station and trailer mounted tracking station.
PHASE switch	S8	Rotary (three-position)	Determines which phase (A, B, or C) of line voltage is monitored on the LINE VOLTS meter.
PLATE VOLTS—ON indicator light	DS32	White	When illuminated, indicates plate voltage is applied to all circuits of the LOPAR system except the high voltage circuits.
PLATE VOLTS—READY indicator light	DS31	Amber	When illuminated, indicates that plate voltage may be applied to all circuits of the LOPAR system except the LOPAR transmitter circuits.
PLATE VOLTS switch	S9	Toggle (two-position)	When set to on (up) position, applies plate voltage to presentation circuits and units in the director station group. Illuminates PLATE VOLTS—ON indicator light and extinguishes PLATE VOLTS—READY indicator light.
PRESENTATION POWER switch	S5	Toggle (two-position, heavy-duty)	When set to ON, performs the functions listed in *a* through *d* below. *a.* Applies ac power to the presentation system of the trailer mounted director station. *b.* Applies filament voltage to the battery control console and to the power supplies of the director station group. *c.* Illuminates INTLK indicator light immediately. *d.* Illuminates PLATE VOLTS—READY indicator light in 20 to 30 seconds.
RADAR TRAILER fuse indicator lights	DS20, DS21, and DS22	Red	When illuminated, indicates associated fuse has blown.
RECORD fuse indicator light	DS5	Red	When illuminated, indicates associated fuse has blown.

Table 6 (U). Acquisition Power Control Panel—Front Panel Controls and Indicators—Continued (*U*)

Control or indicator	Appar des	Type	Function
RADAR TRAILER fuse indicator lights	DS20, DS21, and DS22	Red	When illuminated, indicates associated fuse has blown.
RECORD fuse indicator light	DS5	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—+270V fuse indicator light	DS15	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—−320V fuse indicator light	DS13	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—+320V fuse indicator light	DS14	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—BIAS fuse indicator light	DS12	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—FIL fuse indicator light	DS11	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—IND HV fuse indicator light	DS16	Red	When illuminated, indicates associated fuse has blown.
SIG SYS fuse indicator light	DS3	Red	When illuminated, indicates associated fuse has blown.
TRACK TRANSMITTER FILAMENTS indicator light	DS29	White	When illuminated, indicates filament power is applied to the MTR and TTR transmitters.
TRACK TRANSMITTER FILAMENT switch	S2	Toggle (two-position)	When set to the on (up) position, energizes filament circuits in both the MTR and TTR transmitters. Illuminates TRACK TRANSMITTER FILAMENTS indicator light. *Note.* This switch is not to be used.
UTILITY fuse indicator light	DS1	Red	When illuminated, indicates associated fuse has blown.
VOLTS CHECK meter	M1		Indicates the amplitude of the LOPAR low voltage power supply output selected by the VOLTS CHECK switch. Scale is graduated in segments.
VOLTS CHECK switch	S3	Rotary (12-position)	When set to any position except OFF, switches the indicated LOPAR system low voltage power supply output to the VOLTS CHECK meter for checking purposes.

80 (U). Recorder Group

Controls and indicators of the recorder group (16, fig. 16) are on the multichannel data recorder (6, fig. 23) and fuse and control panel (7, fig. 23). These controls and indicators are described in *a* and *b* below.

a. Multichannel Data Recorder. Nonplacarded controls and indicators of the multichannel data recorder are shown in figure 51, and all controls and indicators are described in table 7.

b. Fuse and Control Panel. Indicators of the fuse and control panel (7, fig. 23) associated with the multichannel data recorder are described in table 8. Controls and indicators of the fuse and control panel associated with the voice communication system are described in TM 9-1425-250-12/1.

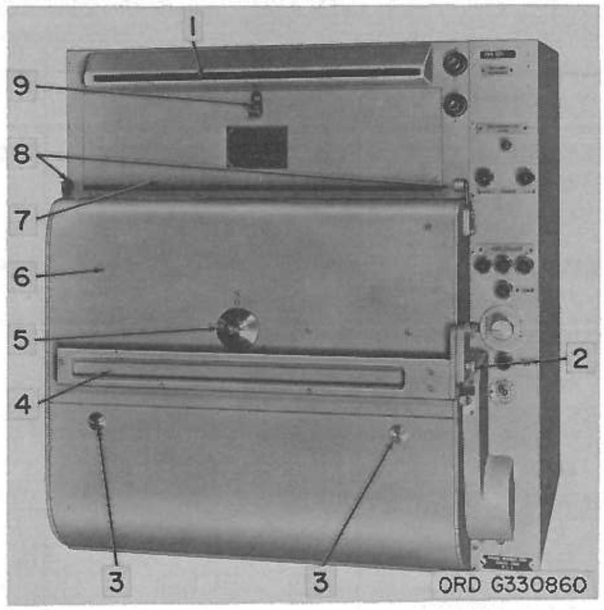


Figure 51 (U). Multichannel data recorder—nonplacarded controls and indicators (U).

Table 7 (U). Multichannel Data Recorder—Controls and Indicators (U)

Control or indicator	Appar des	Type	Function	Key to fig. 51
Direct trace monitoring screen		Viewing	Provides continuous visual monitoring of trace signals to verify that all recording channels are operating.	1
Film footage counter		Dial	Automatically indicates number of feet of recording paper remaining in supply drum provided dial is properly set when multichannel data recorder is loaded.	5
Galvanometer bank access		Door	Provides access to galvanometer bank.	7
GALVANOMETER ZERO switch	S5	Pushbutton	When depressed, removes all input signals from the recording channel and records a zero mark on the recording paper.	
LAMP FAILURE—1 indicator light	I10	Red	When illuminated, indicates failure of galvanometer lamp 1 inside multichannel data recorder.	
LAMP FAILURE—2 indicator light	I6	Red	When illuminated, indicates failure of galvanometer lamp 2 inside multichannel data recorder.	
LAMP FAILURE—T indicator light	I8	Red	When illuminated, indicates failure of timer lamp inside multichannel data recorder.	
Latch		Slide	When actuated, permits opening of galvanometer bank access door.	9
Latch (2)		Slide	When actuated, permits takeup drum, supply drum, and all associated equipment to open downward to allow access to rear internal equipment of the multichannel data recorder.	8
MOTOR ON indicator light	I3		When illuminated, indicates that chart drive motor is energized.	
OPERATE—TEST switch	S1	Toggle (two-position)	When set to OPERATE, multichannel data recorder becomes energized when the equipment status switch on the tactical control-indicator is set to RED, and a target has been designated.	

Table 6 (U). Acquisition Power Control Panel—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
RECTIFIERS—+270V fuse indicator light	DS15	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—−320V fuse indicator light	DS13	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—+320V fuse indicator light	DS14	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—BIAS fuse indicator light	DS12	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—FIL fuse indicator light	DS11	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—IND HV fuse indicator light	DS16	Red	When illuminated, indicates associated fuse has blown.
SIG SYS fuse indicator light	DS3	Red	When illuminated, indicates associated fuse has blown.
TRACK TRANSMITTER FILAMENTS indicator light	DS29	White	When illuminated, indicates filament power is applied to the MTR and TTR transmitters.
TRACK TRANSMITTER FILAMENT switch	S2	Toggle (two-position)	When set to the on (up) position, energizes filament circuits in both the MTR and TTR transmitters. Illuminates TRACK TRANSMITTER FILAMENTS indicator light. *Note.* This switch is not to be used.
UTILITY fuse indicator light	DS1	Red	When illuminated, indicates associated fuse has blown.
VOLTS CHECK meter	M1		Indicates the amplitude of the LOPAR low voltage power supply output selected by the VOLTS CHECK switch. Scale is graduated in segments.
VOLTS CHECK switch	S3	Rotary (12-position)	When set to any position except OFF, switches the indicated LOPAR system low voltage power supply output to the VOLTS CHECK meter for checking purposes.

80 (U). Recorder Group

Controls and indicators of the recorder group (16, fig. 16) are on the multichannel data recorder (6, fig. 23) and fuse and control panel (7, fig. 23). These controls and indicators are described in *a* and *b* below.

a. Multichannel Data Recorder. Nonplacarded controls and indicators of the multichannel data recorder are shown in figure 51, and all controls and indicators are described in table 7.

b. Fuse and Control Panel. Indicators of the fuse and control panel (7, fig. 23) associated with the multichannel data recorder are described in table 8. Controls and indicators of the fuse and control panel associated with the voice communication system are described in TM 9-1400-251-12.

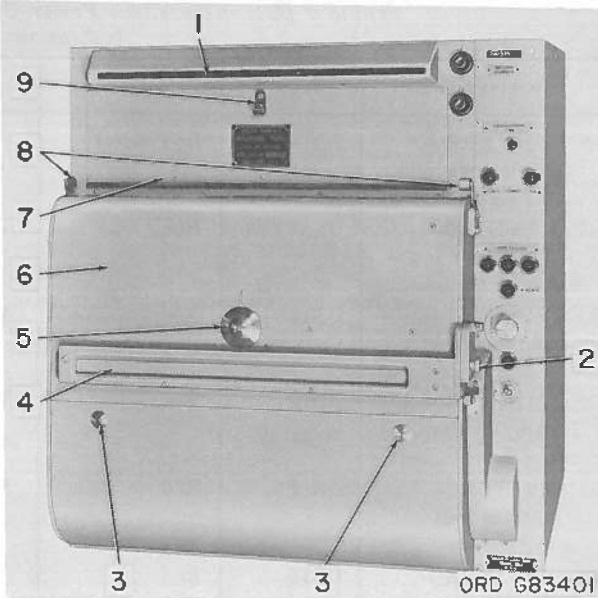


Figure 51 (U). Multichannel data recorder—non-placarded controls and indicators (U).

Table 7 (U). Multichannel Data Recorder—Controls and Indicators (U)

Control or indicator	Appar des	Type	Function	Key to fig. 51
Direct trace monitoring screen		Viewing	Provides continuous visual monitoring of trace signals to verify that all recording channels are operating.	1
Film footage counter		Dial	Automatically indicates number of feet of recording paper remaining in supply drum provided dial is properly set when multichannel data recorder is loaded.	5
Galvanometer bank access		Door	Provides access to galvanometer bank.	7
GALVANOMETER ZERO switch	S5	Pushbutton	When depressed, removes all input signals from the recording channel and records a zero mark on the recording paper.	
LAMP FAILURE—1 indicator light	I10	Red	When illuminated, indicates failure of galvanometer lamp 1 inside multichannel data recorder.	
LAMP FAILURE—2 indicator light	I6	Red	When illuminated, indicates failure of galvanometer lamp 2 inside multichannel data recorder.	
LAMP FAILURE—T indicator light	I8	Red	When illuminated, indicates failure of timer lamp inside multichannel data recorder.	
Latch		Slide	When actuated, permits opening of galvanometer bank access door.	9
Latch (2)		Slide	When actuated, permits takeup drum, supply drum, and all associated equipment to open downward to allow access to rear internal equipment of the multichannel data recorder.	8
MOTOR ON indicator light	I3		When illuminated, indicates that chart drive motor is energized.	
OPERATE—TEST switch	S1	Toggle (two-position)	When set to OPERATE, multichannel data recorder becomes energized when the equipment status switch on the tactical control-indicator is set to RED, and a target has been designated.	

Table 7 (U). Multichannel Data Recorder—Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 51
OPERATE—TEST switch—Continued			When set to TEST, energizes multichannel data recorder.	
POWER—400~ indicator light	I1	Red	When illuminated, indicates 120-volt, 400-cycle power is available at input of multichannel data recorder.	
POWER—D.C. indicator light	I2	Red	When illuminated, indicates 28-volt dc power is available at input of multichannel data recorder.	
RECORD NUMBER counter			At start of each record, indicates number to be recorded on recording paper. After approximately 3 seconds, counter is automatically advanced to next number which is recorded on recording paper at beginning of next record.	
RECORD—VIEW switch	S2	Rotary (two-position)	When set to RECORD, conditions multichannel data recorder for recording data. When set to VIEW, shutter can be opened to view galvanometer traces. Deenergizes chart drive motors.	
Release button (2)		Slide	When actuated, permits opening of associated takeup drum access door and supply drum access door.	3
Shutter			When opened, permits viewing of galvanometer traces.	4
Shutter knob			When rotated, opens shutter for viewing the galvanometer traces.	2
Supply drum access		Door	When opened, provides access to supply drum.	6
VIEW indicator light	I4	Red	When illuminated, indicates that RECORD—VIEW switch is set to VIEW, and shutter can be opened to view the galvanometer traces.	

Table 8 (U). Fuse and Control Panel—Front Panel Indicators (U)

Control or indicator	Appar des	Type	Function
END OF PAPER indicator light	I5	Red	When illuminated, indicates 25 feet of recording paper remains in the supply drum, and remains illuminated until supply has been replenished.
REC ON indicator light	I4	Amber	When illuminated, indicates chart drive motor of the multichannel data recorder is energized.

81 (U). Battery Control Console

Note. The key numbers shown in parentheses in this paragraph refer to figure 22 unless otherwise indicated.

The controls and indicators of the battery control console (14, fig. 16), used by operating personnel, are on the horizontal plotting board (21), upper right frame (6), upper left frame (1), battery signal panel-indicator (10), tactical control-indicator (11), target designate control-indicator (16), PPI (13), precision indicator (15), IFF control-indicator (20), LOPAR control-indicator (19), and either HIPAR or AAR control-indicator (17 A or B). These controls and indicators are described in *a* through *l* below.

a. Horizontal Plotting Board. The controls and indicators of the horizontal plotting board (21) are described in table 9.

Table 9 (U). Horizontal Plotting Board—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
Access pushbutton		Pushbutton	When depressed, releases horizontal plotting board window latch.
Left MISSILE indicator sign	I4	White	When illuminated, indicates missile position information is being plotted by the left recorder pen.
Left TARGET indicator sign	I3	White	When illuminated, indicates target position information is being plotted by the left recorder pen.
Right MISSILE indicator sign	I1	White	When illuminated, indicates missile position information is being plotted by the right recorder pen.
Right TARGET indicator sign	I2	White	When illuminated, indicates target position information is being plotted by the right recorder pen.

b. Upper Right Frame. Nonplacarded controls and indicators of the upper right frame (6) are shown on figure 52 and described in table 10.

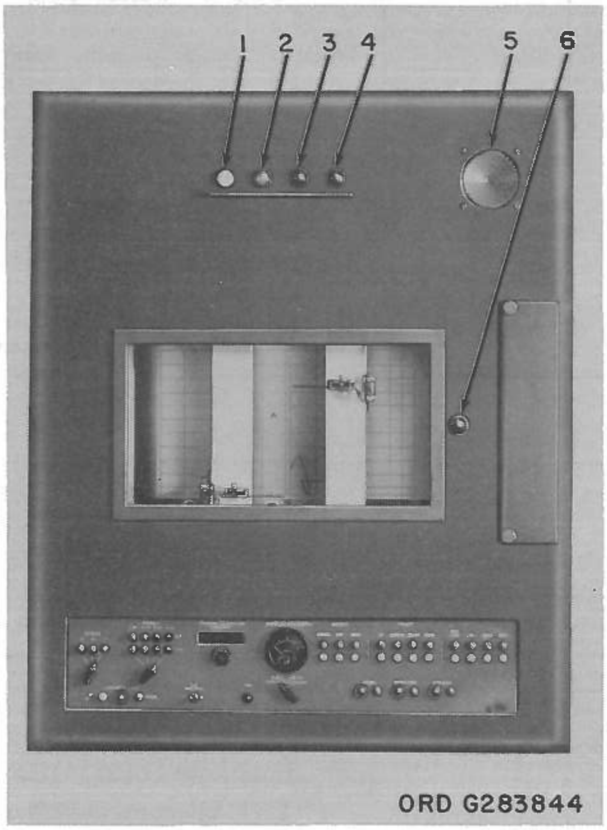


Figure 52 (C). Battery control console—partial view—upper right frame—nonplacarded controls and indicators (U).

Table 7 (U). Multichannel Data Recorder—Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 51
OPERATE—TEST switch—Continued			When set to TEST, energizes multichannel data recorder.	
POWER—400~ indicator light	I1	Red	When illuminated, indicates 120-volt, 400-cycle power is available at input of multichannel data recorder.	
POWER—D.C. indicator light	I2	Red	When illuminated, indicates 28-volt dc power is available at input of multichannel data recorder.	
RECORD NUMBER counter			At start of each record, indicates number to be recorded on recording paper. After approximately 3 seconds, counter is automatically advanced to next number which is recorded on recording paper at beginning of next record.	
RECORD—VIEW switch	S2	Rotary (two-position)	When set to RECORD, conditions multichannel data recorder for recording data. When set to VIEW, shutter can be opened to view galvanometer traces. Deenergizes chart drive motors.	
Release button (2)		Slide	When actuated, permits opening of associated takeup drum access door and supply drum access door.	3
Shutter			When opened, permits viewing of galvonometer traces.	4
Shutter knob			When rotated, opens shutter for viewing the galvanometer traces.	2
Supply drum access		Door	When opened, provides access to supply drum.	6
VIEW indicator light	I4	Red	When illuminated, indicates that RECORD—VIEW switch is set to VIEW, and shutter can be opened to view the galvanometer traces.	

Table 8 (U). Fuse and Control Panel—Front Panel Indicators (U)

Control or indicator	Appar des	Type	Function
END OF PAPER indicator light	I5	Red	When illuminated, indicates 25 feet of recording paper remains in the supply drum, and remains illuminated until supply has been replenished.
REC ON indicator light	I4	Amber	When illuminated, indicates chart drive motor of the multichannel data recorder is energized.

81 (U). Battery Control Console

Note. The key numbers shown in parentheses in this paragraph refer to figure 22 unless otherwise indicated.

The controls and indicators of the battery control console (14, fig. 16), used by operating personnel, are on the horizontal plotting board (21), upper right frame (6), upper left frame (1), battery signal panel-indicator (10), tactical control-indicator (11), target designate control-indicator (16), PPI (13), precision indicator (15), IFF control-indicator (20), LOPAR control-indicator (19), and HIPAR control-indicator (17). These controls and indicators are described in *a* through *j* below.

a. Horizontal Plotting Board. The controls and indicators of the horizontal plotting board (21) are described in table 9.

Table 9 (U). Horizontal Plotting Board—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
Access pushbutton		Pushbutton	When depressed, releases the horizontal plotting board window latch.
Left MISSILE indicator sign	I4	White	When illuminated, indicates missile position information is being plotted by the left recorder pen.
Left TARGET indicator sign	I3	White	When illuminated, indicates target position information is being plotted by the left recorder pen.
Right MISSILE indicator sign	I1	White	When illuminated, indicates missile position information is being plotted by the right recorder pen.
Right TARGET indicator sign	I2	White	When illuminated, indicates target position information is being plotted by the right recorder pen.

b. Upper Right Frame. Nonplacarded controls and indicators of the upper right frame (6) are shown on figure 52 and described in table 10.

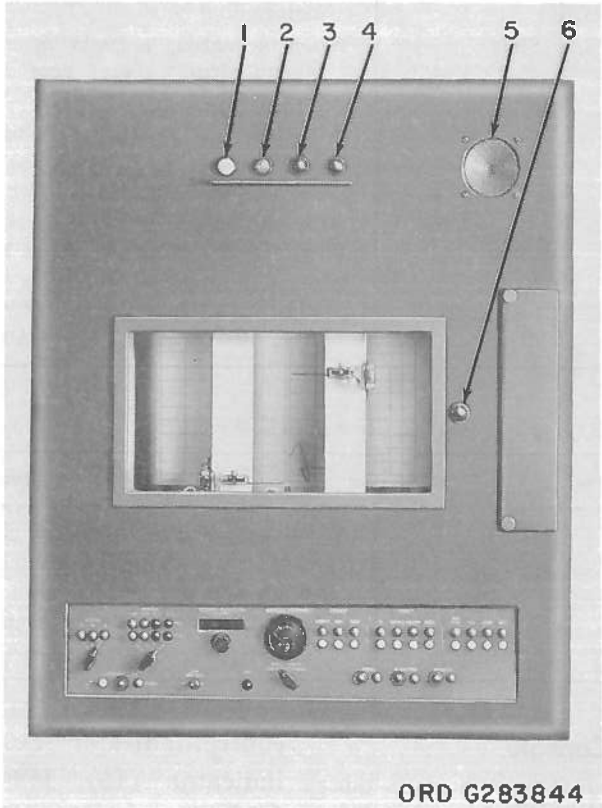


Figure 52 (C). Battery control console—partial view—upper right frame—nonplacarded controls and indicators (U).

Table 10 (U). Upper Right Frame—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function	Key to fig. 52
Equipment status indicator light	DS1	White	When illuminated, indicates white equipment status prevails.	1
Equipment status indicator light	DS2	Yellow	When illuminated, indicates yellow equipment status prevails. *Note.* The yellow status indicator light has no tactical significance in the Improved NIKE-HERCULES System.	2
Equipment status indicator light	DS3	Blue	When illuminated, indicates blue equipment status prevails.	3
Equipment status indicator light	DS4	Red	When illuminated, indicates red equipment status prevails.	4
Loudspeaker	LS1	Dynamic	Because the video alarm circuits have been removed, the loudspeaker has no functional purpose in the Improved NIKE-HERCULES System.	5
Window release		Pushbutton	When depressed, releases the altitude plotting board window latch.	6

c. Battery Signal Panel-Indicator. The controls and indicators of the battery signal panel-indicator (10) are described in table 11.

Table 11 (C). Battery Signal Panel-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
BURST indicator light	I37	Green	When illuminated, indicates the burst order has been issued.
BURST indicator light	I38	Ivory	When illuminated, indicates no burst order has been issued.
B-XW-BURST OFFSET switch	S5	Toggle (two-position)	When set to OUT, disables the normal burst-offset circuits of the computer system and causes the missile prime warhead to detonate directly on or a short distance from the target. When set to IN, detonates the missile prime warhead at a distance from the target determined by the burst-offset circuits of the computer system.
FIRE indicator light	I33	Green	When illuminated, indicates that the fire order has been issued.
FIRE indicator light	I34	Ivory	When illuminated, indicates the fire order has not been issued.
LAUNCH indicator light	I35	Green	When illuminated, indicates the designated missile has been launched.
LAUNCH indicator light	I36	Ivory	When illuminated, indicates a missile has not been launched for the current engagement.
LAUNCHER DATA—NOT RELEASED indicator light	I14	Ivory	When iluminated, indicates no missile or mission data has been released to the launching area.
LAUNCHER DATA—RELEASED indicator light	I15	Green	When illuminated, indicates that the mission and missile information established by the setting of the MISSION switch and the MISSILE switch on the battery signal panel-indicator has been released to the launching area.

Table 11 (C). Battery Signal Panel-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
LAUNCHER DATA switch	S3	Pushbutton	When depressed, releases the mission and missile information established by the setting of the MISSION switch and MISSILE switch on the battery signal panel-indicator to the launching area. Illuminates LAUNCHER DATA—RELEASED indicator light on the battery signal panel-indicator.
LIMITED TARGET DAMAGE indicator light	I16	Red	When illuminated, indicates that the designated target is below the minimum burst altitude of a prime warhead missile.
MANEUVER indicator light	I39	Green	When illuminated, indicates that the computer system is conditioned for a target that is expected to maneuver evasively.
MANEUVER switch	S6	Pushbutton	When depressed, conditions the computer system for a target that is expected to maneuver evasively. Illuminates MANEUVER indicator light on the battery signal panel-indicator.
MIN BURST ALTITUDE 1000'S FEET dial	R1	Rotary	Indicates the setting of the MIN BURST ALTITUDE knob on the battery signal panel-indicator. Dial is graduated from 0 to 30 in increments of 0.5.
MIN BURST ALTITUDE variable resistor	R1	Rotary with lock (knob adjust)	Permits selection of the minimum burst altitude at which a prime warhead missile will detonate.
MISSILE—BTRY—B-HE indicator light	I9	Green	When illuminated, indicates a NIKE-HERCULES high explosive missile has been selected for the immediate engagement.
MISSILE—BTRY—B-XL indicator light	I13	Red	When illuminated, indicates a NIKE-HERCULES large prime warhead missile has been selected for the immediate engagement.
MISSILE—BTRY—B-XS indicator light	I11	Red	When illuminated, indicates a NIKE-HERCULES small prime warhead missile has been selected for the immediate engagement.
MISSILE—BTRY—I-HE indicator light	I7	Green	When illuminated, indicates a NIKE-AJAX high explosive missile has been selected for the immediate engagement.
MISSILE—DESIGNATED indicator light.	I17	Green	When illuminated, indicates either the launcher and section from which the missile is to be fired has been designated, or indicates the simulator group has been designated.
MISSILE—DESIGNATED indicator light	I18	Ivory	When illuminated, indicates neither the launcher, the section from which the missile is to be fired, nor the flight simulator group has been designated.
MISSILE PREPARED meter	M1		Indicates the number of missiles prepared by the launching area for current setting of the MISSILE PREPARED switch on the battery signal panel-indicator. Meter scale is graduated from 0 to 16 in increments of 1.
MISSILE PREPARED switch	S4	Rotary (four-position)	When set, the number of prepared missiles of the type selected is indicated on the MISSILES PREPARED meter on the battery signal panel-indicator.
MISSILE—READY indicator light	I19	Green	When illuminated, indicates the designated missile is ready for firing.
MISSILE—READY indicator light	I20	Ivory	When illuminated, indicates neither the designated missile nor the flight simulator group is ready to be tracked.
MISSILE—REM—B-HE indicator light	I8	Green	When illuminated, indicates a NIKE-HERCULES high explosive missile has been selected for the immediate engagement.
MISSILE—REM—B-XL indicator light	I12	Red	When illuminated, indicates a NIKE-HERCULES large prime warhead missile has been selected for the immediate engagement.

Table 11 (C). Battery Signal Panel-Indicator—Front Panel Controls and Indicators—Continued (*U*)

Control or indicator	Appar des	Type	Function
MISSILE—REM—B-XS indicator light	I10	Red	When illuminated, indicates a NIKE-HERCULES small prime warhead missile has been selected for the immediate engagement.
MISSILE—REM—I-HE indicator light	I6	Green	When illuminated, indicates a NIKE-AJAX high explosive missile has been selected for the immediate engagement.
MISSILE switch	S2	Rotary (four-position)	Permits selection of the type missile (I-HE, B-HE, B-XS, or B-XL) to be used for a particular engagement.
MISSILE—TRACKED indicator light	I21	Green	When illuminated, indicates the designated missile is being tracked by the missile tracking radar system.
MISSILE—TRACKED indicator light	I22	Ivory	When illuminated, indicates neither a missile nor the flight simulator group is being tracked by the missile tracking radar system.
MISSION—LA indicator light	I3	Green	Not used.
MISSION—SA indicator light	I2	Green	When illuminated, indicates a surface-to-air mission has been selected for the immediate engagement.
MISSION—SS indicator light	I1	Green	When illuminated, indicates a surface-to-surface mission has been selected for the immediate engagement.
MISSION switch	S1	Rotary (three-position—push-to-turn for SS position only)	Permits selection of the type mission (surface-to-surface or surface-to-air; low altitude is not used) for a particular engagement.
MULTIPLE TARGET indicator light	I40	Green	When illuminated, indicates the computer system is conditioned to smooth out tracking information so that a formation is acted upon as a single target.
MULTIPLE TARGET switch	S7	Pushbutton	When depressed, conditions the computer system to smooth out tracking information so that a formation is acted upon as a single target. Illuminates the MULTIPLE TARGET indicator light on the battery signal panel-indicator.
NON-MANEUVER indicator light	I41	Green	When illuminated, indicates the computer system is conditioned for a single target that is expected to maneuver little or none at all.
NON-MANEUVER switch	S8	Pushbutton	When depressed, prepares the computer system for a single target that is expected to maneuver little or none at all. Illuminates the NON-MANEUVER indicator light on the battery signal panel-indicator.
READY TO FIRE indicator light	I31	Green	When illuminated, indicates that the designated missile may be fired at any time.
READY TO FIRE indicator light	I32	Ivory	When illuminated, indicates that the firing preparations have not been completed.
SIMULATE indicator light	DS42	Ivory	When illuminated, indicates that the missile firing simulator equipment is in operation or that the test responder in the launching area has been designated.
TARGET—CONFIRMED indicator light	I27	Green	When illuminated, indicates the designated target is being acquired by the target tracking radar system.
TARGET—CONFIRMED indicator light	I28	Ivory	When illuminated, indicates no target has been acquired by the target tracking radar system.
TARGET—DESIGNATED indicator light	I25	Green	When illuminated, indicates the identified target has been designated to the target tracking radar system.
TARGET—DESIGNATED indicator light	I26	Ivory	When illuminated, indicates no target has been designated to the target tracking radar system.

Table 11 (C). Battery Signal Panel-Indicator—Front Panel Controls and Indicators—Continued (U)

Control or indicator	Appar des	Type	Function
TARGET—FOE indicator light	I23	Green	When illuminated, indicates the designated target is hostile.
TARGET—FOE indicator light	I24	Ivory	When illuminated, indicates no target has currently been identified as hostile.
TARGET—TRACKED indicator light	I29	Green	When illuminated, indicates the acquired target is being tracked by the target tracking radar system.
TARGET—TRACKED indicator light	I30	Ivory	When illuminated, indicates no target is currently being tracked by the target tracking radar system.

d. Tactical Control-Indicator. All controls and indicators of the tactical control-indicator (11) are described in table 12. The nonplacarded controls are shown on figure 53.

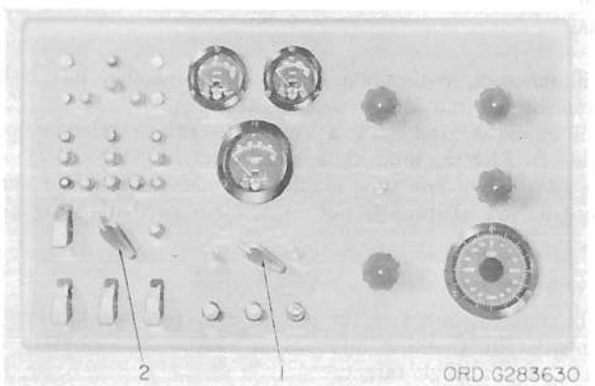


Figure 53 (C). Tactical control-indicator—nonplacarded controls (U).

Table 12 (C). Tactical Control-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function	Key to fig. 53
ACKNOW switch	S1	Pushbutton	When depressed, a signal is sent to the AADCP indicating that the last received signal from the AADCP has been acknowledged. Also silences a buzzer which sounds upon receipt of a signal from the AADCP.	
BURST switch	S5	Toggle (two-position, spring-loaded to down, with guard)	When operated to the on (up) position, causes the computer to issue a burst order.	
CEASE FIRE indicator light	I3	White	When illuminated, indicates the AADCP has transmitted a cease-fire command to the Improved NIKE-HERCULES System.	
CEILING LIGHTS variable resistor	T3	Rotary (knob adjust)	When turned, adjusts the brilliance of the white incandescent ceiling lights, provided the CEILING LIGHTS switch on the tactical control-indicator is set to DIM, and the CEILING LIGHTS switch on the trailer door light panel is set to REMOTE.	

Table 12 (C). Tactical Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 53
CEILING LIGHTS switch	S10	Toggle (two-position)	When set to BRIGHT, illuminates the white incandescent ceiling lights at full brilliance provided the CEILING LIGHTS switch on the trailer door light panel is set to REMOTE.	
COMPUTER—OVERLOAD indicator light	I14	Red	When illuminated or flickering, indicates that one or more of the computer system amplifiers are unbalanced.	
COMPUTER—TEST indicator light	I13	Red	When illuminated, indicates the computer system is not in action condition.	
FEW indicator light	I7	Blue	When illuminated, indicates the AADCP has been informed the target consists of two to five aircraft.	
FEW switch	S14	Pushbutton	When depressed, a signal is sent to the AADCP indicating that the target consists of two to five aircraft. Also illuminates the FEW indicator light on the tactical control-indicator.	
FIRE switch	S4	Toggle (two-position, spring-loaded to down, with guard)	When operated to the on (up) position, causes the fire order to be issued.	
FRIEND switch	S6	Toggle (two-position, spring-loaded to down, with guard)	When operated to the on (up) position, causes the missile tracking radar system to stop tracking the missile in flight and return to the next designated missile or flight simulator group. Causes the engagement sequence (foe to burst) for the immediate target to cease, and the Improved NIKE-HERCULES System to return to a detection condition. Extinguishes the green TARGET—FOE indicator light on the battery signal panel-indicator and illuminates the ivory TARGET—FOE indicator light on the battery signal panel-indicator.	
EFFECTIVE indicator light	I19	Blue	When illuminated, indicates the AADCP has been informed the engagement against the designated target was successful.	
EFFECTIVE switch	S16	Pushbutton	When depressed, a signal is sent to the AADCP indicating that the engagement against the designated target was successful. Also illuminates the EFFECTIVE indicator light on the tactical control-indicator.	
Equipment status switch	S3	Rotary (four-position)	Performs functions described in *a* through *e* below. *a.* Provides means for selecting WHITE, YELLOW, BLUE, or RED status for the Improved NIKE-HERCULES system. *b.* Illuminates corresponding colored equipment status indicator light on the upper right frame (6, fig. 22) and the corresponding colored equipment status indicator light on the upper center access door (2, fig. 32). *c.* Causes a gong to sound in the trailer mounted tracking station whenever the position of the switch is changed.	2

Table 12 (C). Tactical Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 53
Equipment status switch—Continued			*d.* When set to RED, causes multichannel data recorder (6, fig. 23) to begin automatic operation, provided a target has been designated. *e.* When set to YELLOW, BLUE, or RED, establishes command and technical hot loop telephone circuits. Refer to TM 9-1400-251-12.	
GYRO AZIMUTH indicator	B1	Dial	Indicates the gyro azimuth (A_G) angle of the predicted intercept point from 0 to 6400 mils in increments of 50 mils.	
GYRO LIMIT indicator light	I12	Red	When illuminated, indicates the computer system has calculated a turn angle for the missile that exceeds the gyro limits of the roll amount gyro in the missile.	
HOLD FIRE indicator light	I2	White	When illuminated, indicates the AADCP has transmitted a hold-fire command to the Improved NIKE-HERCULES System.	
INEFFECTIVE indicator light	I10	Blue	When illuminated, indicates the AADCP has been informed the engagement against the designated target was unsuccessful.	
INEFFECTIVE switch	S17	Pushbutton	When depressed, a signal is sent to the AADCP indicating that the engagement against the designated target was unsuccessful. Also illuminates the INEFFECTIVE indicator light on the tactical control-indicator.	
KILL switch	S19	Pushbutton	When depressed, a signal is sent to the AADCP indicating that the mission against the designated target was successful.	
LOCAL switch	S2	Pushbutton	When depressed, a signal is sent to the AADCP indicating that the operating sequence and events for the current engagement will originate from the Improved NIKE-HERCULES System.	
LOCAL indicator light	I4	Green	When illuminated, indicates a signal has been sent to the AADCP indicating that the operating sequence and events for the current engagement will originate from the Improved NIKE-HERCULES System.	
MANY indicator light	I8	Blue	When illuminated, indicates the AADCP has been informed the target consists of more than five aircraft.	
MANY switch	S15	Pushbutton	When depressed, a signal is sent to the AADCP indicating that the target consists of more than five aircraft. Also illuminates the MANY indicator light on the tactical control-indicator.	
MBA OVERRIDE switch	S18	Toggle (two-position, with guard)	When operated to the on (up) position, cancels the altitude restriction set by the computer minimum burst altitude circuit to allow the prime warhead missiles to burst below the minimum altitude requirements.	
MISSILE SPEED meter	M2		Indicates the missile air speed from 0 to 3000 knots, in increments of 100 knots.	
ONE indicator light	I6	Blue	When illuminated, indicates the AADCP has been informed the target is a single aircraft.	

Table 12 (C). Tactical Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 53
ONE switch	S13	Pushbutton	When depressed, a signal is sent to the AADCP indicating that the target is a single aircraft. Also illuminates the ONE indicator light on the tactical control-indicator.	
OUT OF ACTION indicator light	I5	Yellow	When illuminated, indicates the Improved NIKE-HERCULES System is incapable of normal action until further notice.	
OUT OF ACTION switch	S12	Pushbutton	When depressed, a signal is sent to the AADCP indicating that the Improved NIKE-HERCULES System is incapable of normal action until further notice. Illuminates the OUT OF ACTION indicator light on the tactical control-indicator.	
PEN INTERCHANGE switch	S9	Toggle (two-position, spring-loaded to down)	When operated to the on (up) position, causes recorder pens of the horizontal plotting board to interchange the data they are currently plotting provided the COMPUTER CONDITION switch on the computer control-panel is set to PRE LAUNCH & INITIAL TURN and the plotting board condition switch on the tactical control-indicator is in any position except REF MARK or STAND BY.	
PEN LIFT switch	S7	Toggle (two-position, spring-loaded to down)	When operated to the on (up) position and the plotting board condition switch on the tactical control-indicator is set to PLOT and recorder pens are down, causes recorder pens to lift from plotting surfaces of horizontal plotting board and altitude plotting board.	
Plotting board condition switch	S8	Rotary (five-position)	Permits selection of mode of operation (REF MARK, STAND BY, OPERATE, PLOT, or TEST) to be performed by horizontal plotting board and altitude plotting board.	
PLOTTING LIGHTS—ALTITUDE variable transformer	T2	Rotary (knob adjust)	When rotated, adjusts the intensity of the illuminating lights of the altitude plotting board (8, fig. 22).	
PLOTTING LIGHTS—HORIZONTAL variable transformer	T1	Rotary (knob adjust)	When rotated, adjusts the intensity of the illuminating lights of the horizontal plotting board (21, fig. 22).	
PRESENT TARGET ALTITUDE meter	M3		Indicates the present altitude of the tracked target.	
REMOTE indicator light	I1	Yellow	When illuminated, indicates a command or information is being transmitted from the AADCP to the Improved NIKE-HERCULES System.	
SIGNAL LIGHTS variable resistor	R1	Rotary (knob adjust)	When turned, adjusts illumination of the indicator lights listed in *a* and *b* below. *a.* Adjusts the intensity of all indicator lights on the battery signal panel-indicator except those listed in (1) through (4) below. (1) MISSILE—REM—B-XS indicator light. (2) MISSILE—REM—B-XL indicator light.	

Table 12 (C). Tactical Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 53
SIGNAL LIGHTS variable resistor —Continued			(3) MISSILE—BTRY—B-XS indicator light. (4) MISSILE—BTRY—B-XL indicator light. *b.* Adjusts the intensity of all indicator lights on the tactical control-indicator except those listed in (1) through (3) below. (1) COMPUTER—OVERLOAD indicator light. (2) COMPUTER—TEST indicator light. (3) GYRO LIMIT indicator light.	
SIREN switch	S11	Pushbutton	When depressed, energizes the siren on the trailer mounted director station.	
TARGET GROUND SPEED meter	M1		Indicates the ground speed of the tracked target from 0 to 1,500 knots, in increments of 100 knots.	
VALIDITY switch	S20	Pushbutton	When depressed, a signal is sent to the AADCP requesting a vertification of the target designation sent from the AADCP.	

e. Target Designate Control-Indicator. All controls and indicators of the target designate control-indicator (16) are described in table 13. The nonplacarded controls are shown on figure 54.

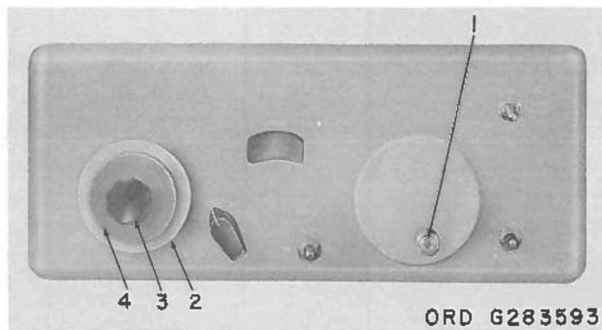


Figure 54 (U). Target designate control-indicator—nonplacarded controls and indicators (U).

Table 13 (C). Target Designate Control-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function	Key to fig. 54
Azimuth synchro (coarse)	B1	Rotary (bottom knob adjust)	When turned, permits coarse positioning of the acquisition (flashing) azimuth line displayed on the PPI.	4
Azimuth synchro (fine)	B1	Rotary (top knob adjust)	When turned, permits precision positioning of the acquisition (flashing) azimuth line displayed on the PPI.	3
Azimuth switch	S1	Ring depress	When depressed, all existing displays on the PPI are removed and an acquisition range dot or a steerable azimuth line is displayed in place of the range mark depending upon the optimum intensity level.	2

Table 13 (C). Target Designate Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 54
DESIGNATE—ABANDON switch	S4	Toggle (two-position, spring-loaded to center)	When operated to DESIGNATE, energizes a buzzer on the target radar control console which indicates that a new target is being designated for tracking. Extinguishes the ivory TARGET—DESIGNATED indicator light and illuminates the green TARGET—DESIGNATED indicator light on the battery signal panel-indicator. Extinguishes the ivory DESIGNATE indicator light and illuminates the green DESIGNATE indicator light on the target track indicator assembly. When operated to ABANDON, extinguishes the green TARGET—DESIGNATED indicator light and illuminates the ivory TARGET—DESIGNATED indicator light on the battery signal panel-indicator. Also extinguishes the green DESIGNATE indicator light and illuminates the ivory DESIGNATE indicator light on the target track indicator assembly indicating the target currently being tracked is to be abandoned. The abandon circuits are inoperative from the time a fire command is initiated until the missile burst signal is received.	
RANGE dial	B5		Indicates the range of the acquisition range circle. Dial is graduated from 0 to 350 representing 0 to 350,000 yards.	
Range handwheel	B5	Rotary	When rotated, adjusts the position of the acquisition range circle.	1
MAN-AID switch	S6	Rotary (two-position)	When set to MAN, the acquisition range circle, as displayed on the PPI (13, fig. 22), is positioned in or out in range at a rate directly proportioned to the manual rotation of the range handwheel on the target antenna control group. When set to AID, permits the acquisition range circle, as displayed on the PPI (13, fig. 22), to continue to move in or out in range automatically after manual release of the range handwheel on the target antenna control group. The rate at which the acquisition range circle moves remains the same as it was at the time the range handwheel was released.	
SLEW switch	S5	Toggle (three-position, spring-loaded to center)	Performs functions described in *a* and *b* below. *a.* When operated to OUT, increases the range of the acquisition range circle at a more rapid rate than by rotating the range handwheel on the target antenna control group. *b.* When operated to IN, decreases the range of the acquisition range circle at a more rapid rate than by rotating the range handwheel on the target antenna control group.	
TRACK CROSS switch	S8	Toggle (two-position)	When set to ON, displays on the PPI an electronic cross which indicates the azimuth and range of the target track and target range radars.	

f. PPI. The controls and indicators of the PPI (13) are described in table 14.

Table 14 (C). PPI—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
Azimuth scale		Dial	Provides a means for determining the azimuth of any display appearing on the PPI. Scale is graduated from 0 to 6,400 mils in increments of 100 mils.
EXPANSION POSITION variable resistor	R19	Rotary (knob adjust)	When turned, positions the origin of the rotating radial sweep from 0 to 6,400 mils around the outer edge of the PPI provided the EXPANSION switch on the PPI is set to ON. The seven positions engraved on the panel are for reference to aid in positioning the origin of the rotating radial sweep.
EXPANSION switch	S3	Rotary (two-position)	When set to ON, moves the origin of the rotating radial sweep from the center to the outer edge of the PPI. When set to OFF, places the origin of the rotating radial sweep at the center of the PPI.
GAIN variable resistor	R5	Rotary (knob adjust)	When turned, adjusts the intensity of all displays on the PPI except the acquisition steerable azimuth line and range mark.
INTENSITY variable resistor	R27	Rotary (knob adjust)	When turned, adjusts the illumination of all video on the PPI except the IFF and FUIF symbols.
LIGHTS variable resistor	R15	Rotary (knob adjust)	When turned, adjusts the illumination of the azimuth scale on the PPI.
Cathode-ray storage tube	V1	PPI scope	Provides continuous displays in range and azimuth of area surrounding the acquisition antenna-receiver-transmitter group. Coverage is 6,400 mils in azimuth, 50,000, 150,000, and 250,000 yards in range for use with LOPAR; and 50,000, 150,000, 250,000, and 350,000 yards in range for use with HIPAR. The PPI scope is blank in the 350,000-yard position if LOPAR is selected.
RANGE switch	S2	Rotary (four-position)	When set to 50,000, 150,000, 250,000, or 350,000, displays only those targets or objects within the range as determined by the RANGE switch position.
SYMBOL INTENSITY variable resistor	R39	Rotary (knob adjust)	When turned, adjusts symbol brilliance of the IFF and FUIF symbols on the PPI.
SYMBOLS switch	S1	Rotary (four-position, spring-loaded to NORMAL from BATTS only)	When set to OFF, displays normal acquisition video only on the PPI. When set to NORMAL, displays normal acquisition video and FUIF symbols on the PPI. When operated to BATTS, displays normal acquisition video and FUIF battery symbols only on the PPI. When operated to BOTH, displays acquisition video and both FUIF symbols and FUIF battery symbols, simultaneously.

g. Precision Indicator. The controls and indicators of the precision indicator (15) are described in table 15.

Table 15 (U). Precision Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
GAIN variable resistor	R9	Rotary (knob adjust)	When turned, adjusts the gain of the entire display except the sweep on the precision indicator.
INTENSITY variable resistor	R5	Rotary (knob adjust)	When turned, adjusts the illumination of the sweep on the precision indicator.
Precision indicator scope	V1	B scope (modified)	Displays a sector of the PPI 25,000 yards in range and 533 mils in azimuth centered about the intersection of the acquisition (flashing) azimuth line and the acquisition range circle.

h. IFF Control-Indicator. The controls and indicators of the IFF control-indicator (20) are described in table 16.

Table 16 (C). IFF Control-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
CHALLENGE ON indicator light	DS2	White	When illuminated, indicates the IFF transmitter output is a pulse pair at normal power level.
CHALLENGE switch	S1	Pushbutton	When depressed, illuminates the CHALLENGE ON indicator light on the IFF control-indicator and causes the interrogator set to interrogate the target.
CHOP switch	S4	Toggle (two-position)	When set to OFF (down) position, provides normal IFF return signals as displayed on the PPI. When set to ON, performs the functions listed in *a* and *b* below. *a.* Produces broken traces of the IFF return signals as displayed on the PPI (13, fig. 22). *b.* Energizes the coder control provided the LOCAL—REMOTE switch on the coder control is set to REMOTE.
FOE switch	S3	Pushbutton	When depressed, illuminates green TARGET—FOE indicator light on the battery signal panel-indicator and extinguishes ivory TARGET—FOE indicator light on the battery signal panel-indicator indicating that the challenged target is hostile.
FRIEND switch	S2	Toggle (two-position, spring-loaded to down, with guard)	When operated to the on (up) position, causes the missile tracking radar system to discontinue tracking the missile in flight and return to the next designated missile or the flight simulator group. Causes the engagement sequence (foe to burst) for the immediate target to cease and the Improved NIKE-HERCULES System to return to a detection condition. Also causes the green TARGET—FOE indicator light on the battery signal panel-indicator to extinguish, and the ivory TARGET—FOE indicator light on the battery signal panel-indicator to illuminate.
GTC switch	S6	Toggle (two-position)	When set to SHORT, automatically conditions the receiver circuits so that the IFF return signals from targets at relatively close ranges are displayed in proper size on the PPI (13, fig. 22). When set to LONG, automatically conditions the receiver circuits of the interrogator set so that the IFF return signals from targets at relatively long ranges are displayed in proper size on the PPI (13, fig. 22).
IFF GAIN variable resistor	R3	Rotary (knob adjust)	When turned, adjusts the gain of the interrogator set receiver to obtain optimum IFF presentation as displayed on the PPI (13, fig. 22).
IFF ON indicator light	DS1	White	When illuminated, indicates the interrogator set is energized.
MODE switch	S5	Toggle (three-position)	When set to 1 position, conditions the video decoder for mode 1 operation and allows selection of a code in mode 1 operation. When set to 2 position, conditions the video decoder for mode 2 operation and allows selection of a code in mode 2 operation. When set to 3 position, conditions the video decoder for mode 3 operation and allows selection of a code in mode 3 operation.
RADAR SELECT switch	S7	Toggle (two-position)	When set to HIPAR/AAR, selects HIPAR/AAR video to be applied to the presentation system. When set to LOPAR, selects LOPAR video to be applied to the presentation system.

i. LOPAR Control-Indicator. The controls and indicators of the LOPAR control-indicator (19) are described in table 17.

Table 17 (U). LOPAR Control-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
AFC RELEASE switch and indicator light	S2 DS3	Pushbutton—(Red)	When depressed, held for 5 seconds, and then released, the LOPAR AFC circuits begin the search cycle for the correct IF as indicated by the illumination of the AFC RELEASE (pushbutton) indicator light. When illuminated to a steady glow, indicates that the LOPAR AFC circuit is searching for the correct IF. When illuminated to a flickering glow, or extinguished, and a strong video appears on the PPI (13, fig. 22), indicates that the LOPAR AFC circuit is locked on the correct IF. When illuminated to a flickering glow, and a reduction or no video appears on the PPI (13, fig. 22), indicates that the LOPAR AFC circuit is locked on the incorrect IF.
AJD—OFF switch	S8	Toggle (two-position)	When set to AJD, enables the AJD video circuits. When set to OFF, disables the auxiliary channel and provides only the normal receiver channel.
ANT ELEV indicator	B1	Dial	Indicates the LOPAR beam angle. Indicator is graduated from 0 to 400 mils in increments of 50 mils.
ANT RPM switch	S3	Rotary (four-position)	When set to OFF, the LOPAR antenna remains stationary. When set to 5, the LOPAR antenna rotates at 5 RPM. When set to 10, the LOPAR antenna rotates at 10 RPM. When set to 15, the LOPAR antenna rotates at 15 RPM.
CONT TRANS switch	S11	Toggle (two-position)	When set to AUTO, permits control of LOPAR to be transferred to the operator at the battery control console provided the RADAR SELECT switch is set to LOPAR. When set to REMOTE, permits the ECCM operator to control LOPAR until after the battery control officer (BCO) has had an opportunity to view the LOPAR presentation. This avoids a sudden change in video presentation when changing from AAR to LOPAR. *Note.* The CONT TRANS switch has no effect on the system when a switch from LOPAR to AAR is made.
DOWN/SCAN—UP switch	S4	Toggle (three-position, spring-loaded to center from up position only)	Controls antenna beam deflection angle of LOPAR system when operated as prescribed in *a* through *c* below. *a.* When operated and held in UP, increases the elevation of the LOPAR transmitted beam to a maximum of 400 mils. *b.* When set to DOWN/SCAN, decreases the elevation of the LOPAR transmitted beam to a minimum of 0 mils. When the DOWN/SCAN switch remains in the DOWN/SCAN position, the LOPAR transmitted beam automatically scans between 0 mils and the upper limit of the prevailing scan condition. *c.* When released from UP, or when set to the center position from DOWN/SCAN, causes elevation of the LOPAR transmitted beam to remain at the elevation angle indicated on the ANT ELEV indicator on the LOPAR control-indicator.
JS ONLY—OFF switch	S7	Toggle (two-position)	When set to JS ONLY, allows only jamming strobe video to be displayed on the presentation system. When set to OFF, displays all video signals on the presentation system.

Table 17 (U). LOPAR Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
LOPAR POWER indicator light	DS2	White	When illuminated, indicates that the LOPAR system is energized through "operate" condition and the transmitter output power is sufficient to provide normal operation. When flickering, indicates arcing in waveguide and/or magnetron circuit.
LOPAR SELECTED indicator light	DS1	Green	When illuminated, indicates that LOPAR video is displayed on the presentation system.
MAG FREQ meter	M1		Indicates relative LOPAR transmitter frequency. Meter is graduated from 0 to 100 in increments of 5 units.
MAG FREQ switch	S1	Toggle (three-position, spring-loaded to center)	When operated to DECR, decreases the LOPAR transmitter frequency to a minimum of 3,100 megacycles. When operated to INCR, increases the frequency of the LOPAR transmitter to a maximum of 3,500 megacycles. When released from either INCR or DECR, the LOPAR transmitter frequency remains at the frequency indicated on the MAG FREQ meter on the LOPAR control-indicator.
MTI switch	S6	Rotary (three-position)	When set to OFF, deenergizes the MTI circuits of the LOPAR system. When set to 360°, causes the MTI circuits to be in effect on the PPI presentation when the LOPAR system is in use. When set to SECTOR, causes the MTI circuit to be in effect over that portion of the PPI presentation selected by the MTI SECTOR ANGLE knob on the LOPAR auxiliary control-indicator.
PROC—IS switch	S9	Toggle (three-position)	When set to PROC, MTI video is squelched and processed video is applied to the presentation system. When set to IS, interference suppressor video is applied to the presentation system. When set to the off (center) position, normal video is applied to the presentation system.
REC GAIN variable resistor	R1	Rotary with switch (knob adjust)	When turned, adjusts the signal gain of the video display on the PPI (13, fig. 22) and the precision indicator (15, fig. 22). When turned to the extreme clockwise position, disables manual receiver gain and applies AGC to the receiver.
STC variable resistor	R2	Rotary (knob adjust)	When turned to OFF (exereme counterclockwise position), disables STC in the LOPAR receivers. When adjusted to any position other than OFF (extreme counterclockwise position), enables STC in the LOPAR receiver.

j. HIPAR Control-Indicator. The controls and indicators of the HIPAR control-indicator (17A, fig. 22) are described in table 18.

Table 18 (U). HIPAR Control-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
AJAC ALL CHANNELS switch-indicator	A16	Pushbutton (two-position, off—white, on—green)	When depressed, illuminates (green) and enables the AJAC programmer to operate on all HIPAR transmitting channels. When illuminated (white), indicates one of the two other AJAC modes is selected.

Table 18 (U). HIPAR Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
AJAC P-P CHANNELS switch-indicator	A17	Pushbutton (two-position, spring-loaded, off—white, on—green)	When depressed and held, illuminates (green) and allows the AJAC programmer to operate in the pulse-to-pulse mode. When released, illuminates (white) and the AJAC programmer reverts to the mode previously selected. *Note.* Do no use this mode of HIPAR operation when designating a target to the TTR.
AJAC SELECTED CHANNELS switch-indicator	A15	Pushbutton (two-position, off—white, on—green)	When depressed, illuminates (green) and enables the AJAC programmer to operate on selected HIPAR transmitting channels. When illuminated (white), indicates one of the two other AJAC modes is selected.
AJD RECEIVER switch-indicator	A13	Pushbutton (two-position, off—white, on—green)	When depressed, illuminates (green) indicating that the AJD receiver has been selected for operation. The STAGGER OFF indicator illuminates (white) and the HIPAR RECEIVER GAIN indicator extinguishes. When illuminated (white), indicates that jam strobe (JS) or basic receiver video has been selected as the presentation displayed on the PPI.
BASIC RECEIVER switch-indicator	A11	Pushbutton (two-position, off—white, on—green)	When depressed, illuminates (green) indicating the basic receiver has been selected for operation. The back-lighting for the HIPAR RECEIVER GAIN indicator illuminates (white), and the gain of the HIPAR receiver is controlled by the HIPAR RECEIVER GAIN knob. When illuminated (white), indicates JS or AJD receiver video has been selected as the presentation displayed on the PPI. The STAGGER OFF indicator extinguishes.
CHANNEL 1 through CHANNEL 10 switch-indicators	A1 through A10	Pushbutton (two-position, off—white, on—green)	When any one switch-indicator is depressed and the MANUAL CHANNEL SELECT switch-indicator is illuminated (white), selects one of ten preset HIPAR transmitter frequencies. The selected CHANNEL indicator illuminates (green), and all other channel indicators illuminate (white).
CONT REQ—CONT REL switch-indicator	A20	Pushbutton (two-position, request—amber, release—green)	Not used with HIPAR.
GAIN variable resistor	R1	Rotary	When rotated, adjusts the gain of the basic receiver, provided the BASIC RECEIVER switch-indicator is illuminated (green).
HIPAR/AAR SELECTED indicator light	DS1	Green	When illuminated, indicates that HIPAR video is displayed on the presentation system.
HIPAR POWER indicator light	DS2	White	When illuminated, indicates the HIPAR is energized through the "operate" condition and the HIPAR transmitter output power is sufficient to provide maximum operation.
JAMMING—AJAC ENABLE switch-indicator	A18	Pushbutton (two-position, OFF—extinguished, AJAC ENABLE—green)	When the AJAC programmer detects jamming, the JAMMING indicator flashes (red). AJAC ENABLE is normally safety-wired down. When depressed, illuminates (green) and enables the three AJAC programmer modes. The CHANNEL 1 through CHANNEL 10 switch-indicators extinguish and the MANUAL CHANNEL SELECT mode is disabled.

Table 17 (U). LOPAR Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
LOPAR POWER indicator light	DS2	White	When illuminated, indicates that the LOPAR system is energized through "operate" condition and the transmitter output power is sufficient to provide normal operation. When flickering, indicates arcing in waveguide and/or magnetron circuit.
LOPAR SELECTED indicator light	DS1	Green	When illuminated, indicates that LOPAR video is displayed on the presentation system.
MAG FREQ meter	M1		Indicates relative LOPAR transmitter frequency. Meter is graduated from 0 to 100 in increments of 5 units.
MAG FREQ switch	S1	Toggle (three-position, spring-loaded to center)	When operated to DECR, decreases the LOPAR transmitter frequency to a minimum of 3,100 megacycles. When operated to INCR, increases the frequency of the LOPAR transmitter to a maximum of 3,500 megacycles. When released from either INCR or DECR, the LOPAR transmitter frequency remains at the frequency indicated on the MAG FREQ meter on the LOPAR control-indicator.
MTI switch	S6	Rotary (three-position)	When set to OFF, deenergizes the MTI circuits of the LOPAR system. When set to 360°, causes the MTI circuits to be in effect on the PPI presentation when the LOPAR system is in use. When set to SECTOR, causes the MTI circuit to be in effect over that portion of the PPI presentation selected by the MTI SECTOR ANGLE knob on the LOPAR auxiliary control-indicator.
PROC—IS switch	S9	Toggle (three-position)	When set to PROC, MTI video is squelched and processed video is applied to the presentation system. When set to IS, interference suppressor video is applied to the presentation system. When set to the off (center) position, normal video is applied to the presentation system.
REC GAIN variable resistor	R1	Rotary with switch (knob adjust)	When turned, adjusts the signal gain of the video display on the PPI (13, fig. 22) and the precision indicator (15, fig. 22). When turned to the extreme clockwise position, disables manual receiver gain and applies AGC to the receiver.
STC variable resistor	R2	Rotary (knob adjust)	When turned to OFF (extreme counterclockwise position), disables STC in the LOPAR receivers. When adjusted to any position other than OFF (extreme counterclockwise position), enables STC in the LOPAR receiver.

j. HIPAR Control-Indicator. The controls and indicators of the HIPAR control-indicator (17) are described in table 18.

Table 18 (U). HIPAR Control-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
CLUTTER GATE switch	S3	Rotary (three-position)	When set to ALL RANGE, displays integrated video or normal video gated with the range gate fixed at minimum range. When set to NORMAL, displays integrated video gated with noncoherent video appearing past the range gate. When set to OFF, displays coherent video, not gated, with only integrated video appearing past the range gate.

Table 18 (U). HIPAR Control-Indicator—Front Panel Controls and Indicators— Continued *(U)*

Control or indicator	Appar des	Type	Function
CONT REL switch	S4	Pushbutton	When depressed applies a ground to unlock the LOPAR jam strobe (JS), interference suppressor (IS), processor, and MTI circuit controls within the ECCM console.
CONT REQ indicator lamp	DS3	Amber	When illuminated, indicates that the ECCM operator at the ECCM console is requesting the release of the LOPAR, JS, IS, processor, and MTI circuit controls which are locked. When extinguished immediately after illumination, indicates that the ECCM operator has made his selections and the LOPAR, JS, IS, processor, and MTI circuit controls are locked.
DISPLAY switch	S1	Rotary (three-position, spring-loaded to center)	When operated to STROBE ONLY, allows only strobe video to be displayed. When operated to STAGGER OFF, bypasses all stagger circuits. When positioned in NORMAL, allows all HIPAR display video functions to be controlled from the trailer mounted director station.
GAIN	R1	Rotary (knob adjust)	When turned, adjusts HIPAR receiver gain when the RECEIVER switch is in the EMERGENCY position.
HIPAR POWER indicator light	DS2	White	When illuminated, indicates the HIPAR is energized through the "operate" condition and the HIPAR transmitter output power is sufficient to provide maximum operation.
HIPAR SELECTED indicator light	DS1	Green	When illuminated, indicates the HIPAR video is displayed on the presentation system.
RECEIVER switch	S2	Toggle (two-position)	When set to NORMAL, allows normal operation with AJD features utilized. When set to EMERGENCY, all AJD features are bypassed.

k. Upper Left Frame. Controls and indicators of the upper left frame are described in table 18.1.

Table 18.1 (U). Upper Left Frame—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
EJECT TRAINER switch	S26	Pushbutton	When depressed, actuates a circuit that disconnects radar signal simulator AN/MPQ-T1 (T1 trainer) from the trailer mounted director station, the trailer mounted tracking station, and the HIPAR.
EJECT TRAINER indicator light	DS6	Blue	When illuminated, indicates that the T1 trainer is cabled to the trailer mounted director station, the trailer mounted tracking station, the HIPAR or all three. When extinguished, indicates that the T1 trainer is not connected to either trailer, or the HIPAR.

82 (U). Auxiliary Acquisition Control Interconnecting Group

The controls and indicators of the auxiliary acquisition control interconnecting group (6, fig. 16) are on the auxiliary acquisition control interconnecting group (fig. 21), HIPAR auxiliary control-indicator (6, fig. 21), LOPAR auxiliary control-indicator (4, fig. 21), and IFF auxiliary control-indicator (3, fig. 21). These controls and indicators are described in *a* through *d* below.

a. The indicators of the auxiliary acquisition control interconnecting group (fig. 21) are described in table 19.

Table 18 (U). HIPAR Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
JS ONLY RECEIVER switch-indicator	A12	Pushbutton (two-position, off—white, on—amber)	When depressed, illuminates (amber) indicating the JS receiver has been selected for operation. The HIPAR RECEIVER GAIN light extinguishes. When illuminated (white), indicates basic or AJD receiver video has been selected as the presentation displayed on the PPI.
MANUAL CHANNEL SELECT switch-indicator	A14	Pushbutton (two-position, off—white, on—green)	When depressed, illuminates (green) indicating that one of the ten HIPAR channels may be manually selected. When illuminated (white), the MANUAL CHANNEL SELECT mode is disabled and the AJAC programmer is enabled.
STAGGER OFF switch-indicator	A19	Pushbutton (two-position, spring-loaded, on—amber, off—green)	When illuminated (amber), indicates the HIPAR transmitter is operating in the staggered pulse repetition frequency (PRF) mode (AJD RECEIVER is selected). When illuminated (green), indicates the HIPAR transmitter is operating in the stagger off mode (BASIC RECEIVER is selected). When depressed and the AJD RECEIVER is selected, illuminates (green) and the HIPAR transmitter operates at a steady PRF.

k. *AAR Control-Indicator.* The controls and indicators of the AAR control-indicator (17B, fig. 22) are described in table 18.1.

Table 18.1 (U). AAR Control-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
AAR SELECTED indicator light	DS1	Green	When illuminated (green), indicates that AAR video is displayed on the presentation system.
AAR CONT ACT indicator light	DS2	White	When illuminated (white), indicates that the AAR controls are operative from the battery control console.
LOCAL—AAR CONT AUTO switch	S4	Toggle (two-position)	When set to LOCAL, control is at the battery control console. When set to AAR CONT AUTO, control is at the ECCM console.
LOPAR CONT REL switch	S3	Pushbutton	When operated, releases the LOPAR jam strobe (JS), interference suppressor (IS), processor, and MTI circuit controls to the ECCM console.
LOPAR CONT REQ indicator light	DS4	Amber	When illuminated, indicates that the ECCM console is requesting control of the LOPAR jam strobe (JS), interference suppressor (IS), processor, and MTI circuit.
Mode switch	S1	Rotary (four-position)	When set to NORMAL RECEIVER, selects the linear receiver and range gate functions of the AAR. When set to ECCM POSITION 1, selects the range gate receiver and logic functions of the AAR. When set to ECCM POSITION 2, selects the azimuth strobe, logic, MTI DF, AND CKTS, and the range gate receiver functions of the AAR. When set to CHAFF WEATHER, selects the MTI-2 and MTI DF functions of the AAR.
RADIATE OFF switch	S6	Pushbutton	When depressed, deenergizes the AAR magnetron and amplitron.

Table 18.1 (U). AAR Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
RADIATE ON switch	S5	Pushbutton	When depressed, activates the AAR magnetron and amplitron, and the AAR begins to radiate.
RADIATE ON indicator light	DS5	Green	When illuminated (green), indicates that the AAR is radiating RF energy.
RADIATE READY indicator light	DS3	Amber	When illuminated (amber), indicates that the AAR is ready to radiate, and the AAR timers have run down.
RANGE GATE DURATION variable resistor	R5	Rotary	Varies range gate duration.

l. Upper Left Frame. Controls and indicators of the upper left frame are described in table 18.2.

Table 18.2 (U). Upper Left Frame—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
EJECT TRAINER switch	S26	Pushbutton	When depressed, actuates a circuit that disconnects radar signal simulator AN/MPQ-T1 (T1 trainer) from the trailer mounted director station, the trailer mounted tracking station, and the HIPAR.
EJECT TRAINER indicator light	DS6	White	When illuminated, indicates that the T1 trainer is cabled to the trailer mounted director station, the trailer mounted tracking station, the HIPAR, or all three. When extinguished, indicates that the T1 trainer is not connected to either trailer or the HIPAR.

82 (U). Auxiliary Acquisition Control Interconnecting Group

The controls and indicators of the auxiliary acquisition control interconnecting group (6, fig. 16) are on the auxiliary acquisition control interconnecting group (fig. 21), HIPAR auxiliary control-indicator (6, fig. 21), LOPAR auxiliary control-indicator (4, fig. 21), and IFF auxiliary control-indicator (3, fig. 21). These controls and indicators are described in *a* through *d* below.

a. The indicators of the auxiliary acquisition control interconnecting group (fig. 21) are described in table 19.

Table 19 (U). Auxiliary Acquisition Control Interconnecting Group—Front Panel Indicators (U)

Control or indicator	Appar des	Type	Function
0.031A-COMP—+250V fuse indicator light	DS4	Red	When illuminated, indicates that associated fuse has blown.
0.031A-COMP—−250V fuse indicator light	DS3	Red	When illuminated, indicates that associated fuse has blown.
0.031A-ACQ RADAR—+250V fuse indicator light	DS2	Red	When illuminated, indicates that associated fuse has blown.

Table 19 (U). Auxiliary Acquisition Control Interconnecting Group—Front Panel Indicators (U)

Control or indicator	Appar des	Type	Function
0.031A–COMP—+250V fuse indicator light	DS4	Red	When illuminated indicates that associated fuse has blown.
0.031A–COMP—−250V fuse indicator light	DS3	Red	When illuminated indicates that associated fuse has blown.
0.031A–ACQ RADAR—+250V fuse indicator light	DS2	Red	When illuminated indicates that associated fuse has blown.
0.031A–ACQ RADAR—−250V fuse indicator light	DS1	Red	When illuminated indicates that associated fuse has blown.

b. HIPAR Auxiliary Control-Indicator. The controls and indicators of the HIPAR auxiliary control-indicator (6, fig. 21) are described in table 20.

Table 20 (U). HIPAR Auxiliary Control-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
BATTLE SHORT switch-indicator	A11	Pushbutton (two-position, with guard, off—white on—red)	When depressed, causes the interlock circuits to be bypassed and reduces the time delay within the HIPAR system from 15 minutes to 10 minutes.
CHANNEL 1 through CHANNEL 10 switch-indicators	A1 through A10	Pushbutton (two-position, off—white, on—green)	When any one pushbutton is depressed, selects one of ten preset HIPAR transmitter frequencies. The selected CHANNEL indicator illuminates (green), and all other channel indicators illuminate (white).
DRIVE OVERLOAD RESET switch-indicator	A12	Pushbutton (two-position, off—white, on—red)	When illuminated (red), indicates the RF driver output is removed from the klystron amplifier. When depressed, the RF driver output is applied to the klystron amplifier, and the indicator light illuminates (white).

Table 19 (U). Auxiliary Acquisition Control Interconnecting Group—Front Panel Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
0.031A–ACQ RADAR——250V fuse indicator light	DS1	Red	When illuminated, indicates that associated fuse has blown.

b. HIPAR Auxiliary Control-Indicator. The controls and indicators of the HIPAR auxiliary control-indicator (6, fig. 21) are described in table 20.

Table 20 (U). HIPAR Auxiliary Control-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
BATTLE SHORT switch-indicator	A11	Pushbutton (two-position with guard, off—white, on—red)	When depressed, causes the interlock circuits to be bypassed and reduces the time delay within the HIPAR system from 15 minutes to 10 minutes.
DRIVE OVER-LOAD RESET switch-indicator	A12	Pushbutton (two-position, off—white, on—red)	When illuminated (red), indicates the RF driver output is removed from the klystron amplifier. When depressed, the RF driver output is applied to the klystron amplifier, and the indicator light illuminates (white).

Table 20 (U). HIPAR Auxiliary Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
HIPAR ON indicator light	A15	Off—white, on—green	When illuminated (green), indicates that the klystron amplifier is operating.
HIPAR OPERATE indicator light	A16	Off—white, on—green	When illuminated (white), indicates the delay timers in the HIPAR system have clocked down. When illuminated (green), indicates operation of the HIPAR is controlled from the trailer mounted director station.
HIPAR READY indicator light	A14	Off—white, on—amber	When illuminated (amber), indicates timing cycles have been completed and high voltage may be applied to the HIPAR system.
POWER OUTPUT meter	M1		Indicates relative HIPAR transmitter power output. Scale factor is 0 to 25 kw in increments of 1 kw.
TEST ENABLE switch-indicator	A13	Pushbutton (two-position, with guard, off—white, on—red)	When illuminated (white), indicates HIPAR is controlled from the trailer mounted director station, overriding the switches in the HIPAR building. When illuminated (red), indicates HIPAR is being controlled from the HIPAR building.

c. LOPAR Auxiliary Control-Indicator. The controls and indicators of the LOPAR auxiliary control-indicator (4, fig. 21) are described in table 21.

Table 21 (U). LOPAR Auxiliary Control-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
HV SUPPLY—START variable transformer	T1	Rotary (knob adjust)	When turned, adjusts the high voltage being applied to the LOPAR transmitter system as indicated on the MAGNETRON meter. (Must be in START position, fully ccw, before high voltage can be applied to the transmitter system.)
HV SUPPLY—OFF switch	S5	Pushbutton	When depressed, removes high voltage from the LOPAR transmitter system. Extinguishes the HV SUPPLY—ON indicator light and illuminates the HV SUPPLY—READY indicator light. Extinguishes the HIGH VOLTS—ON indicator light on the acquisition power control panel and illuminates the indicator lights on the acquisition power control panel listed in *a* through *d* below. *a.* HIGH VOLTS—READY indicator light. *b.* HIGH VOLTS—HOT indicator light. *c.* HIGH VOLTS—PREHEAT indicator light. *d.* INTLK indicator light.
HV SUPPLY—ON indicator light	DS3	Red	When illuminated, indicates that high voltage is being applied to the LOPAR transmitter system.
HV SUPPLY—ON switch	S4	Pushbutton	When depressed, applies high voltage to the LOPAR transmitter system. Illuminates HV SUPPLY—ON indicator light and extinguishes HV SUPPLY—READY indicator light. Illuminates HIGH VOLTS—ON indicator light on the acquisition power control panel and extinguishes the indicator lights on the acquisition power control panel listed in *a* through *d* below. *a.* HIGH VOLTS—READY indicator light. *b.* HIGH VOLTS—HOT indicator light. *c.* HIGH VOLTS—PREHEAT indicator light. *d.* INTLK indicator light.

Table 21 (U). LOPAR Auxiliary Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
HV SUPPLY—READY indicator light	DS4	Green	When illuminated, indicates the high voltage may be applied to the LOPAR transmitter system.
INDICATOR HV indicator light	DS5	White	When illuminated, indicates that high voltage is being applied to the PPI (13, fig. 22) and to the precision indicator (15, fig. 22).
INDICATOR HV switch	S6	Toggle (two-position)	When set to ON, applies high voltage to the PPI (13, fig. 22) and the precision indicator (15, fig. 22).
MAGNETRON meter	M1		Indicates magnitude of high voltage, average current, and average current in milliamperes depending upon position of MAGNETRON switch.
MAGNETRON switch	S1	Toggle (three-position spring-loaded to center)	When operated to RECT-KV FS-10 position, MAGNETRON meter indicates magnitude of high voltage being applied to the LOPAR magnetron. When operated to MAGMA FS-50 position, MAGNETRON meter indicates average current of the LOPAR magnetron. When operated to RECT MA FS-1000 position, MAGNETRON meter indicates average current of the LOPAR magnetron in milliamperes.
MTI SECTOR ANGLE synchro	B1	Rotary with lock (knob adjust)	When turned, positions the LOPAR MTI sector on the PPI (13, fig. 22) to any azimuth throughout 360 degrees.
NOISE GEN switch	S2	Rotary (five-position)	When set to AUX MEAS, disables noise test circuit and causes the NOISE meter to provide an indication that is used in conjunction with the noise reference level for calculating the noise of the auxiliary receiver channel. When set to AUX ADJ, enables the noise test circuit in the auxiliary receiver channel and causes the NOISE meter to indicate the noise reference level of the auxiliary receiver channel. When set to OFF, disables the noise test circuit. When set to MAIN ADJ, enables the noise test circuits in the main acquisition receiver channel and causes the NOISE meter to indicate the noise reference level of the main acquisition receiver channel. When set to MAIN MEAS, disables noise test circuit and causes the NOISE meter to provide an indication that is used in conjunction with the noise reference level for calculating the noise of the main acquisition receiver channel.
NOISE meter	M2		Indicates noise level with NOISE GEN switch in any position except OFF.

d. IFF Auxiliary Control-Indicator. The controls of the IFF auxiliary control-indicator (3, fig. 21) are described in table 22.

Table 22 (C). IFF Auxiliary Control-Indicator—Front Panel Controls (U)

Control or indicator	Type	Function
MODE 1 CODE switch (inner knob)	Rotary (five-position)	When set to any number between zero (0) and three (3), selects the second significant number of the code for mode 1 operation. When set to REM, transfers control of code settings from the master remote switching control to a remote point where auxiliary remote switching control may be utilized.

Table 22 (C). IFF Auxiliary Control-Indicator—Front Panel Controls—Continued *(U)*

Control or indicator	Type	Function
MODE 1 CODE switch (outer knob)	Rotary (eight-position)	When set to any number between zero (0) and seven (7), selects the first significant number of the code for mode 1 operation.
MODE 2 CODE switch (inner knob)	Rotary (eight-position)	When set to any number between zero (0) and seven (7), selects the second significant number of the code for mode 2 operation.
MODE 2 CODE switch (outer knob)	Rotary (eight-position)	When set to any number between zero (0) and seven (7), selects the first significant number of the code for mode 2 operation.
MODE 3 CODE switch (inner knob)	Rotary (eight-position)	When set to any number between zero (0) and seven (7), selects the second significant number of the code for mode 3 operation.
MODE 3 CODE switch (outer knob)	Rotary (eight-position)	When set to any number between zero (0) and seven (7), selects the first significant number of the code for mode 3 operation.
OPERATE—TEST switch	Toggle (two-position)	When set to OPERATE, the coded pulses are sent to the video decoder to determine the identity of the challenged target. When set to TEST, the coded pulses are set via the recognition signal simulator to the presentation system for display on the PPI.

83 (U). Computer Power Supply Group

The controls and indicators of the computer power supply group (fig. 19), used by operating personnel, are on the computer power control panel and the simulator control panel. These controls and indicators are described in *a* and *b* below.

a. The controls and indicators of the computer power control panel are described in table 23.

Table 23 (U). Computer Power Control Panel—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
COMPUTER POWER ON—FUSE INDICATOR light	I17, I18, and I19	Red	When illuminated, indicates associated fuse has blown.
COMPUTER POWER on indicator light	I20, I21, and I22	White	When illuminated, indicates each phase of the 3-phase power is available to the computer system.
COMPUTER POWER switch	S5	Toggle (two-position, heavy duty)	When set to ON, makes ac power available to the computer system.
FILAMENTS—REG fuse indicator light	I8	Red	When illuminated, indicates associated fuse has blown.
FILAMENTS—UNREG fuse indicator light	I7	Red	When illuminated, indicates associated fuse has blown.
INTLK OVERRIDE switch	S1	Toggle (two-position, spring-loaded to down)	When operated to the on (up) position, bypasses all interlock switches associated with the servo computer assembly (3B, fig. 16), computer amplifier-relay group (3A, fig. 16), and the computer power supply group (3C, fig. 16).
INTLK READY indicator light	I25	White	When illuminated, indicates plate voltage may be applied to the computer system.
MOTOR & SERVO EXC—A fuse indicator light	I11	Red	When illuminated, indicates associated fuse has blown.

Table 23 (U). Computer Power Control Panel—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
MOTOR & SERVO EXC—B fuse indicator light	I10	Red	When illuminated, indicates associated fuse has blown.
MOTOR & SERVO EXC—C fuse indicator light	I9	Red	When illuminated, indicates associated fuse has blown.
PLATE VOLTS indicator light	I24	White	When illuminated, indicates plate voltage is being applied to the computer system.
PLATE VOLTS switch	S4	Toggle (two-position)	When set to ON, applies plate voltage to the computer system. Illuminates PLATE VOLTS indicator light and extinguishes INTLK READY indicator light.
PLOT LIGHTS fuse indicator light	I12	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—320V A fuse indicator light	I6	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—320V B fuse indicator light	I5	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—320V BIAS fuse indicator light	I4	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—270V fuse indicator light	I3	Red	When illuminated, indicates associated fuse has blown.
RECTIFIERS—FIL fuse indicator light	I1	Red	When illuminated, indicates associated fuse has blown.
REGULATORS—−200V A fuse indicator light	I16	Red	When illuminated, indicates associated fuse has blown.
REGULATORS—−200V B fuse indicator light	I15	Red	When illuminated, indicates associated fuse has blown.
REGULATORS—−250V fuse indicator light	I13	Red	When illuminated, indicates associated fuse has blown.
REGULATORS—+250V fuse indicator light	I14	Red	When illuminated, indicates associated fuse has blown.
SERVO DC indicator light	I23	White	When illuminated, indicates dc power is being applied to the servos of the computer system.
SERVO DC switch	S3	Toggle (two-position)	When set to ON, applies dc power to the servos of the computer system. Illuminates the SERVO DC indicator light.
VOLTS CHECK meter			Indicates the output voltage amplitude of each of the computer power supplies as selected by the VOLTS CHECK switch. Scale is graduated in segments.
VOLTS CHECK switch	S2	Rotary (16-position)	When set, switches the output voltage of the power supplies of the computer system, as indicated by switch setting, to the VOLTS CHECK meter for checking purposes.

b. The controls and indicators of the simulator control panel are described in table 23.1. Since all the simulator control panel circuitry is connected to the T1 trainer, the simulator control panel is automatically disabled when the T1 trainer cables are ejected or disconnected from the system.

Table 23.1 (U). Simulator Control Panel—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
ALARM RESET switch	S2	Pushbutton	When depressed, silences the off-target buzzer.
DEFENDING MISSILE—LIVE indicator light	DS1	Green	When illuminated, indicates the MISSILE SELECT switch is set to the live missile (up) position.
DEFENDING MISSILE—SIMULATED indicator light	DS2	Green	When illuminated, indicates the MISSILE SELECT switch is set to the simulated missile (down) position.
MISSILE SELECT switch	S1	Toggle (two-position)	When set to the simulated missile (down) position, disables the MTR antenna positioning circuits and the fire circuit. When this occurs, the DEFENDING MISSILE—SIMULATED indicator light illuminates and the sum video IF is applied to the radar set group from the T1 trainer. When set to the live missile (up) position, the sum video IF input from the T1 trainer is removed and the no-loss indication applied to the T1 trainer is removed. When this occurs, the DEFENDING MISSILE—LIVE indicator light illuminates and the DEFENDING MISSILE—SIMULATED indicator light extinguishes.
Off-target buzzer	DS7	Buzzer	Provides audible alarm when the TTR loses the simulated target being tracked.
SIMULATED TARGET—NOT TRACKED indicator light	DS4	White	Illuminates when the TTR loses the simulated target being tracked.
SIMULATED TARGET—TRACKED indicator light	DS3	Green	Illuminates when a simulated target is being tracked.
SIMULATOR POWER—OFF indicator light	DS6	White	Illuminates when power from the T1 trainer to the simulator control panel is off.
SIMULATOR POWER—ON indicator light	DS5	Red	Illuminates when power from the T1 trainer is applied to the simulator control panel.

84 (U). Servo Computer Assembly

The controls and indicators of the servo computer assembly (fig. 18), used by operating personnel, are on the computer control-panel and behind lower compartment doors. These controls and indicators are described in *a* and *b* below.

a. Computer Control-Panel. The controls and indicators of the computer control-panel are described in table 24.

Table 24 (C). Computer Control-Panel—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
ACCELERATION, VELOCITY AND POSITION DIFFERENCE —H, G_T meter	M3		Indicates the H (up-down) coordinate of target velocity, target acceleration, missile velocity, position difference from missile to target, or G_T (computed turn acceleration) as determined by the setting of the TARGET MISSILE switch.
ACCELERATION, VELOCITY AND POSITION DIFFERENCE —Y, G_p meter	M2		Indicates the Y (north-south) coordinate of target velocity, target acceleration, missile velocity, position difference from missile to target, or G_p (pitch) steering order as determined by the setting of the TARGET MISSILE switch.
ACCELERATION, VELOCITY AND POSITION DIFFERENCE —X, G_y meter	M1		Indicates the X (east-west) coordinate of target velocity, target acceleration, missile velocity, position difference from missile to target, or G_y (yaw) steering order as determined by the setting of the TARGET MISSILE switch.
ACTION indicator light	I1	Green	When illuminated, indicates the computer system is in the action condition.
AMPLIFIER UNBALANCE —GR1 indicator light	I3	Red	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 1 in the computer amplifier-relay group (3A, fig. 16).
AMPLIFIER UNBALANCE —GR2 indicator light	I4	Red	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 2 in the computer amplifier-relay group (3A, fig. 16).
AMPLIFIER UNBALANCE —GR3 indicator light	I5	Red	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 3 in the computer amplifier-relay group (3A, fig. 16).
AMPLIFIER UNBALANCE —GR4 indicator light	I6	Red	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 4 in the computer amplifier-relay group (3A, fig. 16).
AMPLIFIER UNBALANCE —GR5 indicator light	I7	Red	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 5 in the computer amplifier-relay group (3A, fig. 16).
AMPLIFIER UNBALANCE —GR6 indicator light	I8	Red	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 6 in the computer amplifier-relay group (3A, fig. 16).
AMPLIFIER UNBALANCE —GR7 indicator light	I9	Red	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 7 in the computer amplifier-relay group (3A, fig. 16).
AMPLIFIER UNBALANCE —GR8 indicator light	I10	Red	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 8 in the computer amplifier-relay group (3A, fig. 16).
AMPLIFIER UNBALANCE —GR9 indicator light	I11	Red	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 9 in the computer amplifier-relay group (3A, fig. 16).
AMPLIFIER UNBALANCE —GR10 indicator light	I12	Red	When illuminated or flickering, indicates an unbalanced condition in one of the computing amplifiers in group 10 in the computer amplifier-relay group (3A, fig. 16).

Table 24 (C). Computer Control-Panel—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
COMPUTER CONDITION switch	S1	Rotary (five-position)	When set, selects the mode of operation to be performed by the computer system corresponding to the switch setting.
GYRO AZIMUTH 100's MILS switch	S2	Rotary (eight-position)	When set, causes the GYRO AZIMUTH dial on the servo computer assembly to indicate a gyro azimuth (A_0) value corresponding to the switch setting multiplied by 100, provided the computer system is in the steering test or standby condition.
LOCATION OF LAUNCHER FROM TARGET RADAR—YARDS —H dial	R14		Indicates the H (up-down) parallax distance, in yards, to the center of the launching area from the target track antenna-receiver-transmitter group. The dial is graduated from 6,000 DN to 6,000 UP in increments of 100 yards.
LOCATION OF LAUNCHER FROM TARGET RADAR—YARDS —H variable resistor	R14	Rotary with lock (knob adjust)	When turned, compensates for the H (up-down) parallax distance to the center of the launching area from the target track antenna-receiver-transmitter group as indicated on the LOCATION OF LAUNCHER FROM TARGET RADAR—YARDS—H dial.
LOCATION OF LAUNCHER FROM TARGET RADAR—YARDS —R dial	R15		Indicates the R (range) parallax distance to the center of the launching area from the target track antenna-receiver-transmitter group. The dial is nonlinearly graduated from 1,000 to 6,000 yards.
LOCATION OF LAUNCHER FROM TARGET RADAR—YARDS —R switch	S1	Rotary 11-position (knob adjust)	When turned, compensates for the R (range) parallax distance to the center of the launching area from the target track antenna-receiver-transmitter group as indicated on the LOCATION OF LAUNCHER FROM TARGET RADAR—YARDS—R dial.
LOCATION OF LAUNCHER FROM TARGET RADAR—YARDS —X dial	R12		Indicates the X (east-west) parallax distance, in yards, to the center of the launching area from the target track antenna-receiver-transmitter group. The dial is graduated from 6,000 E (east) to 6,000 W (west) in increments of 100 yards.
LOCATION OF LAUNCHER FROM TARGET RADAR—YARDS —X variable resistor	R12	Rotary with lock (knob adjust)	When turned, compensates for the X (east-west) parallax distance to the center of the launching area from the target track antenna-receiver-transmitter group, as indicated on the LOCATION OF LAUNCHER FROM TARGET RADAR—YARDS—X dial.
LOCATION OF LAUNCHER FROM TARGET RADAR—YARDS —Y dial	R13		Indicates the Y (north-south) parallax distance in yards from the center of the launching area to the target track antenna-receiver-transmitter group. The dial is graduated from 6,000 S (south) to 6,000 N (north) in increments of 100 yards.
LOCATION OF LAUNCHER FROM TARGET RADAR—YARDS —Y variable resistor	R13	Rotary with lock (knob adjust)	When turned, compensates for the Y (north-south) parallax distance to the center of the launching area from the target track antenna-receiver-transmitter group, as indicated on the LOCATION OF LAUNCHER FROM TARGET RADAR—YARDS—Y dial.
LOCATION OF MISSILE RADAR FROM TARGET RADAR—YARDS —H dial	R11		Indicates the H (up-down) parallax distance, in yards, from the target track antenna-receiver-transmitter group to the missile track antenna-receiver-transmitter group. The dial is graduated from 166 UP to 166 DN in increments of 2 yards.

Table 24 (C). Computer Control-Panel—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
LOCATION OF MISSILE RADAR FROM TARGET RADAR—YARDS —H variable resistor	R11	Rotary with lock (knob adjust)	When turned, compensates for the H (up-down) parallax distance of the missile track antenna-receiver-transmitter group from the target track antenna-receiver-transmitter group as indicated on the LOCATION OF MISSILE RADAR FROM TARGET RADAR—YARDS—H dial.
LOCATION OF MISSILE RADAR FROM TARGET RADAR—YARDS —X dial	R9		Indicates the X (east-west) parallax distance, in yards, from the target track antenna-receiver-transmitter group to the missile track antenna-receiver-transmitter group. The dial is graduated from 166 E (east) to 166 W (west) in increments of 2 yards.
LOCATION OF MISSILE RADAR FROM TARGET RADAR—YARDS —X variable resistor	R9	Rotary with lock (knob adjust)	When turned, compensates for the X (east-west) parallax distance of the missile track antenna-receiver-transmitter group from the target track antenna-receiver-transmitter group as indicated on the LOCATION OF MISSILE RADAR FROM TARGET RADAR—YARDS—X dial.
LOCATION OF MISSILE RADAR FROM TARGET RADAR—YARDS —Y dial	R10		Indicates the Y (north-south) parallax distance, in yards, from the target track antenna-receiver-transmitter group to the missile track antenna-receiver-transmitter group. The dial is graduated from 166 N (north) to 166 S (south) in increments of 2 yards.
LOCATION OF MISSILE RADAR FROM TARGET RADAR—YARDS —Y variable resistor	R10	Rotary with lock (knob adjust)	When turned, compensates for the Y (north-south) parallax distance of the missile track antenna-receiver-transmitter group from the target track antenna-receiver-transmitter group as indicated on the LOCATION OF MISSILE RADAR FROM TARGET RADAR—YARDS—Y dial.
PARALLAX DATA RECORD plate			Provides means for manually recording the following data: X, Y, and H parallax to missile track antenna-receiver-transmitter group from the target track antenna-receiver-transmitter group; and X, Y, H, and R, parallax to the center of the launching area from the target track antenna-receiver-transmitter group.
POS DIFF YDS/10 switch	S6	Pushbutton	When depressed, increases sensitivity of the ACCELERATION, VELOCITY AND POSITION DIFFERENCE meters by a factor of 10, provided the TARGET MISSILE switch is set to POS DIF FROM TARGET YDS.
SERVO LIGHTS variable resistor	R16	Rotary (knob adjust)	When turned, adjusts the intensity of the illuminating lights for the dials of the servo computer assembly.
STATIC TEST—PRE-LAUNCH & INITIAL TURN switch	S4	Rotary (eight-position)	When set, selects the static test problem, corresponding to the switch setting, to be introduced into the prelaunch and initial turn circuits of the computer system, provided COMPUTER CONDITION switch is set to PRE LAUNCH & INITIAL TURN.
STATIC TEST—STEERING switch	S3	Rotary (eight-position)	When set, selects the static test problem, corresponding to the switch setting, to be introduced into the steering circuits of the computer system, provided COMPUTER CONDITION switch is set to STEERING.
TARGET MISSILE switch	S5	Rotary (seven-position)	When set, the ACCELERATION, VELOCITY, AND POSITION DIFFERENCE meters indicates information corresponding to the switch setting.
TEST indicator light	I2	Red	When illuminated, indicates the computer system is in either the test condition or the standby condition.
TEST switch	S7	Rotary (six-position)	When set, causes computer to receive a simulated missile and mission request, corresponding to the switch setting, provided the computer system is in the test condition.
TT/VC SERVO UNBAL indicator light	I13	Red	When illuminated or flickering, indicates transit time and/or velocity correction servos are slewing.

b. Behind Lower Compartment Doors. The indicators behind the lower compartment doors of the servo computer assembly (fig. 20) are described in table 25.

Table 25 (C). Servo Computer Assembly—Lower Compartment Doors—Front Panel Indicators (U)

Control or indicator	Appar des	Type	Function
BALLISTIC EL dial			Indicates the ballistic elevation angle of the predicted intercept point. Dial is graduated from −1,600 to +1,600 mils in increments of 5 mils.
CLIMB ANGLE dial			Indicates the computed climb angle of the missile. Dial is graduated from 0 to 6,400 mils in increments of 5 mils.
GYRO AZIMUTH dial			Indicates the gyro azimuth (A_G) angle of the predicted intercept point. Dial is graduated from 0 to 6,400 mils in increments of 5 mils.
TIME TO INTERCEPT dial			Indicates the length of time until intercept. Dial is graduated from 0 to 200 seconds in increments of 0.001 second.
TURN ANGLE dial			Indicates the computed turn angle of the missile. Dial is graduated from −1,600 to +1,600 mils in increments of 5 mils.

Section II (C). DESCRIPTION OF FRONT PANEL CONTROLS AND INDICATORS IN THE TRAILER MOUNTED TRACKING STATION

85 (U). Trailer Lighting Equipment, Trailer Heating Equipment, and Equipment Cooling System

a. Trailer Lighting Equipment. The controls of the trailer lighting equipment in the trailer mounted tracking station are on the trailer door light panel, electric light control, target radar control console, trailer ceiling, and entrance door frame. The nonplacarded controls are shown on figure 55, and all controls are described in table 26.

Table 26 (U). Trailer Mounted Tracking Station—Trailer Lighting Equipment—Controls (U)

Control or indicator	Appar des	Type	Function	Key to fig. 55
Blacklight fixture with switch (5)		Pushbutton	When depressed, controls fluorescent blacklight in associated blacklight fixture.	1
BLACKOUT OVERRIDE switch	S5B	Toggle (two-position, with guard)	When set to OFF, all white incandescent ceiling lights extinguish, and all blue blackout ceiling lights illuminate when the trailer mounted tracking station door is opened. When set to on (up) position, all white incandescent ceiling lights and blue blackout ceiling lights are unaffected by opening and closing of the trailer mounted tracking station door.	
CEILING LIGHTS variable transformer	T1	Rotary (knob adjust)	When rotated, adjusts the brilliance of all white incandescent ceiling lights, provided CEILING LIGHTS switch on the electric light control is set to DIM, and CEILING LIGHTS switch on the trailer door light panel is set to REMOTE.	
CEILING LIGHTS switch	S1	Toggle (two-position)	When set to BRIGHT, illuminates all white incandescent ceiling lights at full brilliance, provided CEILING LIGHTS switch on trailer door light panel is set to REMOTE. When set to DIM, brilliance of all white incandescent ceiling lights is controlled by CEILING LIGHTS knob on the electric light control, provided CEILING LIGHTS switch on trailer door light panel is set to REMOTE.	

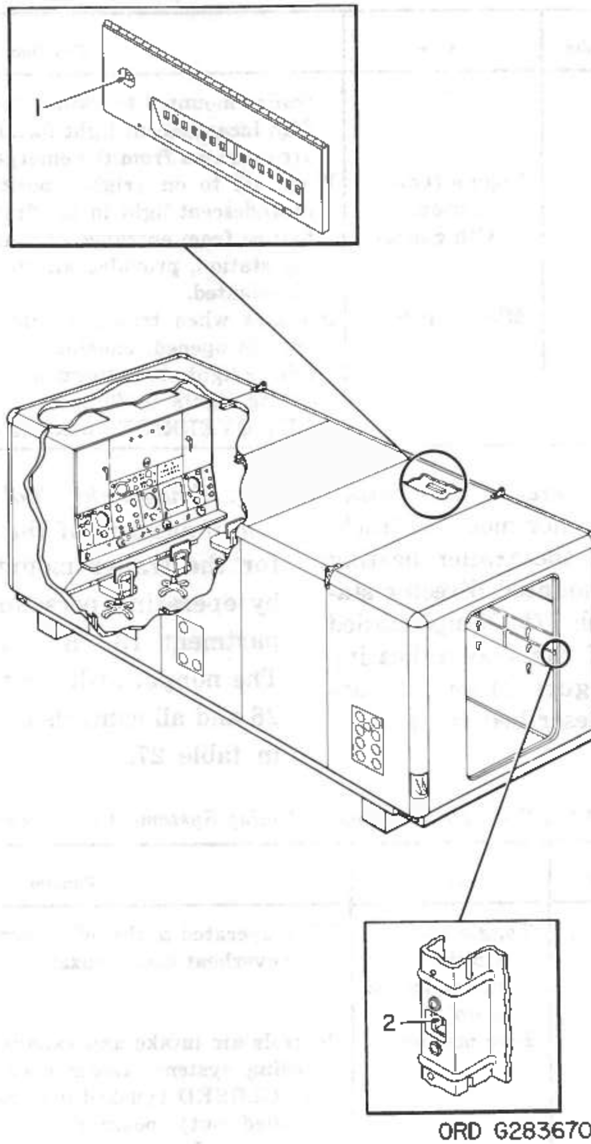


Figure 55 (U). Trailer mounted tracking station—trailer lighting equipment—nonplacarded controls (U).

Table 26 (U). Trailer Mounted Tracking Station—Trailer Lighting Equipment—Controls—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 55
CEILING LIGHTS switch	S5A	Toggle (two-position)	When set to ON, illuminates all white incandescent ceiling lights at full intensity. When set to REMOTE, control of all but two of the white incandescent ceiling lights is transferred to the CEILING LIGHTS knob and CEILING LIGHTS switch on the electric light control. The two white ceiling lights not controlled remotely are located one in the second incandescent light fixture from the rear of the	

Table 26 (U). Trailer Mounted Tracking Station—Trailer Lighting Equipment—Controls—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 55
CEILING LIGHTS switch—Continued			trailer mounted tracking station and one in the fifth incandescent light fixture. These two lights are operated from the emergency 24-volt circuit.	
ENTRANCE LIGHT OVERRIDE switch	S6	Toggle (two-position, with guard)	When set to on (right) position, controls white incandescent light in the first incandescent light fixture from entrance of trailer mounted tracking station, provided all other white lights are illuminated.	
Trailer door interlock switch	S4	Microswitch	Operates when trailer mounted tracking station door is opened, causing all white incandescent ceiling lights to extinguish and all blue blackout ceiling lights to illuminate, provided BLACKOUT OVERRIDE switch is set to OFF.	2

b. Trailer Heating Equipment. The trailer heating equipment in the trailer mounted tracking station is identical to the trailer heating equipment in the trailer mounted director station, described in paragraph 77*b*. Nonplacarded controls and indicators of the trailer heating equipment are shown on figure 24 and all controls and indicators are described in tables 2 and 3 (par. 77*b*).

c. Equipment Cooling System. The controls and indicators of the equipment cooling system for the trailer mounted tracking station used by operating personnel are in the upper compartment (3, fig. 26) of the utility cabinet. The nonplacarded controls are shown on figure 26 and all controls and indicators are described in table 27.

Table 27 (U). Utility Cabinet—Equipment Cooling System—Controls and Indicators (U)

Control or indicator	Appar des	Type	Function	Key to fig. 26
Buzzer switch	S1	Toggle (two-position spring-loaded to up)	When operated to the off (down) position, silences the overheat alarm buzzer.	13
Damper and shutter lever		Five-position	Controls air intake and exhaust of the equipment cooling system. Lever may be operated from the CLOSED (pushed in) position to the OPEN (pulled out) position in increments of one-quarter inch.	11
EXHAUST TEMPERATURE meter			Indicates temperature of exhaust air from −20° to +180° F in increments of 5 degrees.	
OPERATING INSTRUCTIONS plate			Provides instructions for operation of equipment cooling system, covering damper settings, filter replacements, and alarms.	
RSG OVERHEATED indicator light	DS4	Red	When illuminated, indicates the temperature of radar set group cooling air has reached 140° F. Extinguishes when temperature drops below 130° F.	
System overheated indicator light	DS2	Red	When illuminated, indicates the temperature of the system cooling air has reached 140° F. Extinguishes when temperature drops below 130° F.	12
TTC OVERHEATED indicator light	DS3	Red	When illuminated, indicates the temperature of target radar control console cooling air has reached 140° F. Extinguishes when temperature drops below 130° F.	

86 (U). Radar Power Supply Group

The controls and indicators of the radar power supply group are on the front of the radar power control-indicator (8, fig. 33) and on the missile and target fuse panel (2, fig. 33). These controls and indicators are described in *a* and *b* below.

a. Radar Power Control-Indicator. The controls and indicators of the radar power control-indicator (8, fig. 33) are described in table 28.

Table 28 (U). Radar Power Control-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
ACCESSORIES fuse indicator lights	I40 and I41	Red	When illuminated, indicates the associated fuse has blown.
ADJUST PHASE C variable resistor	R1	Rotary (knob adjust)	When rotated, adjusts the magnitude of phase C of the input line voltage as indicated on the LINE VOLTS meter.
BATTLE SHORT switch	S1	Toggle (two-position, with guard)	When set to the on (up) position, causes the low voltage interlock circuits and delay timers in the TTR and MTR systems to be bypassed.
EQPT VENT fuse indicator lights	I27, I28, and I29	Red	When illuminated, indicates the associated fuse has blown.
INTLK OVERRIDE switch	S2	Toggle (two-position, springloaded to down)	When operated to the on (up) position, all interlock switches in the trailer mounted tracking station, except the trailer door interlock switch on the entrance door frame, are bypassed.
LINE VOLTS meter	M2		Indicates the magnitude of each phase of the three-phase input line voltage as selected by the position of the PHASE switch. Scale is graduated from 0 to 150 volts in increments of 5 volts.
MAIN POWER switch	S6	Toggle (two-position, heavy-duty)	When set to ON, performs the functions listed in *a* through *e* below. *a.* Makes three-phase power available to the TTR and MTR systems. *b.* Energizes all blowers in the target and missile track antenna-receiver-transmitter groups. *c.* Energizes radome inflation blower, provided the BLOWER switch (5, fig. 45) is set to ON. *d.* Energizes the equipment cooling fan motor (17, fig. 28), provided EQPT VENT switch is set to ON. *e.* Makes power available to radar test set group.
MISSILE—EXCITATION—AZ HP SERVO fuse indicator light	I22	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—EXCITATION—EL HP SERVO fuse indicator light	I23	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—EXCITATION—AZ MOTOR fuse indicator light	I19	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—EXCITATION—MOTOR fuse indicator light	I20	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—EXCITATION—SERVO fuse indicator light	I21	Red	When illuminated, indicates the associated fuse has blown.

Table 28 (U). Radar Power Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
MISSILE—FILAMENTS—ANT fuse indicator light	I18	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—FILAMENTS—CONSOLE fuse indicator light	I16	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—FILAMENTS—RNG-REC fuse indicator light	I17	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—HIGH VOLTS—HOT indicator light	I53	Amber	When illuminated, indicates 5-minute delay time has elapsed, and filaments of the high voltage circuits of the transmitter system of the MTR system are hot.
MISSILE—HIGH VOLTS—ON indicator light	I55	Red	When illuminated, indicates that high voltage is applied to the transmitter of the MTR system.
MISSILE—HIGH VOLTS—PREHEAT indicator light	I52	White	When illuminated, indicates that filament voltage is being applied to the entire MTR system. This light remains on until missile HV SUPPLY—ON pushbutton on the missile track control power supply is depressed.
MISSILE—HIGH VOLTS—READY indicator light	I54	Green	When illuminated, indicates high voltage may be applied to the transmitter system of the MTR system.
MISSILE—IND HV fuse indicator light	I24	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—INTLK indicator light	I49	Green	When illuminated, indicates MTR system interlock circuit is closed. When extinguished, indicates interlock circuit is open or high voltage is applied to the transmitter system of the MTR system.
MISSILE—PLATE VOLTS—ON indicator light	I51	White	When illuminated, indicates plate voltage is applied to all circuits of the MTR system, except the high voltage circuits.
MISSILE—PLATE VOLTS—READY indicator light	I50	Amber	When illuminated, indicates plate voltage may be applied to all circuits of the MTR system, except the high voltage circuits.
MISSILE—PLATE VOLTS switch	S11	Toggle (two-position, with guard)	When set to the on (up) position, performs the functions listed in *a* through *e* below, provided filament voltage has been applied to the magnetron high voltage circuits for 5 minutes. *a.* Applies plate voltage to all circuits of the MTR system, except the high voltage circuits of the magnetron and the indicator high voltage circuits. *b.* Illuminates MISSILE—PLATE VOLTS—ON indicator light. *c.* Extinguishes MISSILE—PLATE VOLTS—READY indicator light. *d.* Illuminates MISSILE—HIGH VOLTS—READY indicator light. *e.* Illuminates HV SUPPLY—READY indicator light on the missile track control power supply.

Table 28 (U). Radar Power Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
MISSILE POWER switch	S7	Toggle (two-position, heavy-duty)	When set to ON, performs the functions listed in *a* through *d* below. *a.* Applies primary power to the MTR system. *b.* Illuminates MISSILE—INTLK indicator light immediately. *c.* Illuminates MISSILE—HIGH VOLTS—PREHEAT indicator light in 5 seconds. *d.* Illuminates MISSILE—PLATE VOLTS—READY indicator light in 20 to 30 seconds.
MISSILE—RECTIFIERS—2.5 & 5KV fuse indicator light	I25	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—RECTIFIERS ——500V fuse indicator light	I26	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—STANDBY—POWER—FIL fuse indicator light	I15	Red	When illuminated, indicates the associated fuse has blown.
PHASE switch	S9	Rotary (three-position)	When set, determines which phase (A, B, or C) of line voltage is monitored on the LINE VOLTS meter.
RECTIFIERS—+270V fuse indicator light	I38	Red	When illuminated, indicates the associated fuse has blown.
RECTIFIERS—+320V A fuse indicator light	I34	Red	When illuminated, indicates the associated fuse has blown.
RECTIFIERS—+320V B fuse indicator light	I36	Red	When illuminated, indicates the associated fuse has blown.
RECTIFIERS——320V A fuse indicator light	I33	Red	When illuminated, indicates the associated fuse has blown.
RECTIFIERS——320V B fuse indicator light	I35	Red	When illuminated, indicates the associated fuse has blown.
RECTIFIERS—+450V fuse indicator light	I37	Red	When illuminated, indicates the associated fuse has blown.
RECTIFIERS—BIAS A fuse indicator light	I32	Red	When illuminated, indicates the associated fuse has blown.
RECTIFIERS—BIAS B fuse indicator light	I39	Red	When illuminated, indicates the associated fuse has blown.
RECTIFIERS—FIL fuse indicator light	I30	Red	When illuminated, indicates the associated fuse has blown.
RECTIFIERS—REG fuse indicator light	I31	Red	When illuminated, indicates the associated fuse has blown.

Table 28 (U). Radar Power Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
STANDBY POWER—BLK LIGHT fuse indicator light	I14	Red	When illuminated, indicates the associated fuse has blown.
STANDBY POWER—UTILITY fuse indicator light	I13	Red	When illuminated, indicates the associated fuse has blown.
TARGET—EXCITATION—AZ HP SERVO fuse indicator light	I7	Red	When illuminated, indicates the associated fuse has blown.
TARGET—EXCITATION—AZ MOTOR fuse indicator light	I4	Red	When illuminated, indicates the associated fuse has blown.
TARGET—EXCITATION—EL SERVO fuse indicator light	I8	Red	When illuminated, indicates the associated fuse has blown.
TARGET—EXCITATION—MOTOR fuse indicator light	I5	Red	When illuminated, indicates the associated fuse has blown.
TARGET—EXCITATION—SERVO fuse indicator light	I6	Red	When illuminated, indicates the associated fuse has blown.
TARGET—FILAMENTS—ANT fuse indicator light	I3	Red	When illuminated, indicates the associated fuse has blown.
TARGET—FILAMENTS—CONSOLE fuse indicator light	I1	Red	When illuminated, indicates the associated fuse has blown.
TARGET—FILAMENTS—RNG-REC fuse indicator light	I2	Red	When illuminated, indicates the associated fuse has blown.
TARGET—HIGH VOLTS—HOT indicator light	I46	Amber	When illuminated, indicates 5-minute delay time has elapsed, and filaments of the high voltage circuits of the TTR system transmitter are hot.
TARGET—HIGH VOLTS—ON indicator light	I48	Red	When illuminated, indicates high voltage is applied to the transmitter system of the TTR system.
TARGET—HIGH VOLTS—PREHEAT indicator light	I45	White	When illuminated, indicates that filament voltage is applied to the entire TTR system. This light remains on until target HV SUPPLY—ON pushbutton on the target track control-power supply is depressed.
TARGET—HIGH VOLTS—READY indicator light	I47	Green	When illuminated, indicates high voltage can be applied to the transmitter system of the TTR system.
TARGET—IND HV fuse indicator light	I9	Red	When illuminated, indicates the associated fuse has blown.
TARGET—INTLK indicator light	I42	Green	When illuminated, indicates the TTR system interlock circuit is closed.

Table 28 (U). Radar Power Control-Indicator—Front Panel Controls and Indicators—Continued (*U*)

Control or indicator	Appar des	Type	Function
TARGET—PLATE VOLTS—ON indicator light	I44	White	When illuminated, indicates plate voltage is applied to all circuits on the TTR system, except the high voltage circuits.
TARGET—PLATE VOLTS—READY indicator light	I43	Amber	When illuminated, indicates plate voltage may be applied to all circuits of the TTR system, except the high voltage circuits.
TARGET—PLATE VOLTS switch	S10	Toggle (two-position, with guard)	When set to the on (up) position, performs the functions listed in *a* through *e* below, provided filament voltage has been applied to the magnetron high voltage circuits for 5 minutes. *a.* Applies plate voltage to all circuits of the TTR system, except the high voltage circuits of the magnetron and the indicator high voltage circuits. *b.* Illuminates TARGET—PLATE VOLTS—ON indicator light. *c.* Extinguishes TARGET—PLATE VOLTS—READY indicator light. *d.* Illuminates TARGET—HIGH VOLTS—READY indicator light. *e.* Illuminates HV SUPPLY—READY indicator light on the target track control-power supply.
TARGET POWER switch	S5	Toggle (two-position, heavy-duty)	When set to ON, performs the functions listed in *a* through *d* below. *a.* Applies primary power to the TTR system. *b.* Illuminates TARGET—INTLK indicator light immediately. *c.* Illuminates TARGET—HIGH VOLTS—PREHEAT indicator light in 5 seconds. *d.* Illuminates TARGET—PLATE VOLTS—READY indicator light in 20 to 30 seconds.
TARGET—RECTIFIERS, 2.5 & 5KV fuse indicator light	I10	Red	When illuminated, indicates the associated fuse has blown.
TARGET—RECTIFIERS—-500V fuse indicator light	I11	Red	When illuminated, indicates the associated fuse has blown.
TARGET—STANDBY POWER-FIL fuse indicator light	I12	Red	When illuminated, indicates the associated fuse has blown.
VOLTS CHECK meter	M1		Indicates the amplitude of the target radar low voltage power supply output selected by the VOLTS CHECK—TARGET switch, or the missile radar low voltage power supply output selected by the VOLTS CHECK—MISSILE switch. Scale is stamped from 0 to 150 volts, graduated from 30 to 150 volts in increments of 5 volts.
VOLTS CHECK—MISSILE switch	S4	Rotary (13-position)	When set to any position except TARGET, switches the MTR system to low voltage power supply, indicated by the switch setting, to the VOLTS CHECK meter for checking purposes.
VOLTS CHECK—TARGET switch	S3	Rotary (16-position)	When set to any position except OFF, switches the TTR system low voltage power supply output, indicated by the switch setting, to the VOLTS CHECK meter for checking purposes, provided the VOLTS CHECK—MISSILE switch is set to TARGET.

b. Missile and Target Fuse Panel. The fuse indicator lights of the missile and target fuse panel (2, fig. 33) are described in table 29.

Table 29 (U). Missile and Target Fuse Panel—Front Panel Fuse Indicator Lights (U)

Control or indicator	Appar des	Type	Function
MISSILE—18KV fuse indicator lights	I56, I57, and I58	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—350V fuse indicator lights	I59, I60, and I61	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—250V B fuse indicator light	I63	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—ANTENNA BLOWERS fuse indicator lights	I68, I69, and I70	Red	When illuminated, indicates the associated fuse has blown.
MISSILE—B CODER fuse indicator light	I71	Red	When illuminated, indicates the associated fuse has blown.
MISSILE SHUTTER fuse indicator light	I62	Red	When illuminated, indicates the associated fuse has blown.
TARGET—18KV fuse indicator lights	I72, I73, and I74	Red	When illuminated, indicates the associated fuse has blown.
TARGET—+220V A fuse indicator light	I82	Red	When illuminated, indicates the associated fuse has blown.
TARGET—−250V A fuse indicator light	I79	Red	When illuminated, indicates the associated fuse has blown.
TARGET—350V fuse indicator lights	I75, I76, and I77	Red	When illuminated, indicates the associated fuse has blown.
TARGET—ANTENNA BLOWERS fuse indicator lights	I65, I66, and I67	Red	When illuminated, indicates the associated fuse has blown.
TARGET—SHUTTER fuse indicator light	I78	Red	When illuminated, indicates the associated fuse has blown.

87 (U). Target Ranging Radar Control

The controls and indicators of the target ranging radar control (2, fig. 28) are on the range radar power control-indicator (1, fig. 29). These controls and indicators are described in table 30.

Table 30 (U). Range Radar Power Control-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
−28V/E fuse indicator light	DS3	Red	When illuminated, indicates the associated fuse has blown.
120V KEEP ALIVE fuse indicator light	DS17	Red	When illuminated, indicates the associated fuse has blown.
−250V REG. fuse indicator light	DS6	Red	When illuminated, indicates the associated fuse has blown.

Table 30 (U). Range Radar Power Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
+350V POWER SUPPLY fuse indicator lights	DS18, DS19, and DS20	Red	When illuminated, indicates the associated fuse has blown.
ADJUST PHASE C variable resistor	R1	Rotary (knob adjust)	When rotated, adjusts the magnitude of the phase C input line voltage as indicated on the LINE VOLTAGE meter. *Note.* During single engine-driven generator operation, phase C adjustments must be made on the radar power control-indicator.
ANT. BLOWERS fuse indicator lights	DS21, DS22, and DS23	Red	When illuminated, indicates the associated fuse has blown.
BATTLE SHORT switch	S18	Toggle (two-position, with guard)	When set to the on (up) position, the interlock circuits and delay timers in the TRR system are by passed.
EXCITATION—AZ MOTOR fuse indicator light	DS25	Red	When illuminated, indicates the associated fuse has blown.
EXCITATION—AZ SERVO fuse indicator light	DS27	Red	When illuminated, indicates the associated fuse has blown.
EXCITATION—EL MOTOR fuse indicator light	DS26	Red	When illuminated, indicates the associated fuse has blown.
EXCITATION—EL SERVO fuse indicator light	DS28	Red	When illuminated, indicates the associated fuse has blown.
EXCITATION—SERVO fuse indicator light	DS24	Red	When illuminated, indicates the associated fuse has blown.
FILAMENTS—ANT. fuse indicator light	DS9	Red	When illuminated, indicates the associated fuse has blown.
FILAMENTS—CAB fuse indicator light	DS8	Red	When illuminated, indicates the associated fuse has blown.
FILAMENTS—RECT. fuse indicator light	DS11	Red	When illuminated, indicates the associated fuse has blown.
FILAMENTS—REG fuse indicator light	DS10	Red	When illuminated, indicates the associated fuse has blown.
FREQUENCY—A–B switch	S6	Toggle (two-position)	When set to A, indicates the relative frequency of magnetron A on the FREQUENCY meter. When set to B, indicates the relative frequency of magnetron B on the FREQUENCY meter.
FREQUENCY—DCR–INCR switch	S7	Toggle (three-position, springloaded to center)	*Note.* Prior to operation of the FREQUENCY—DCR-INCR switch, set the TEST—OPERATE SWITCH to TEST. When held in DCR, the TRR magnetron, as selected by the MAG SEL switch is tuned to a progressively lower frequency until the lower frequency limit is reached. When held in INCR, the TRR magnetron, as selected by the MAG SEL switch, is tuned to a progressively higher frequency until the high frequency limit is reached. When released, the frequency of the magnetron, as selected by the MAG SEL switch, remains at the frequency indicated on the FREQUENCY meter.

Table 30 (U). Range Radar Power Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
FREQUENCY meter	M3		Indicates the relative frequency of the magnetron as selected by the FREQUENCY—A–B switch.
HIGH VOLTAGE—HOT indicator light	DS35	Amber	When illuminated, indicates filaments of the high voltage circuits for both A and B transmitters of the TRR system are hot.
HIGH VOLTAGE—ON A indicator light	DS32	Red	When illuminated, indicates high voltage is applied to the A transmitter of the TRR system.
HIGH VOLTAGE—ON B indicator light	DS31	Red	When illuminated, indicates high voltage is applied to the B transmitter of the TRR system.
HIGH VOLTAGE—PREHEAT indicator light	DS36	White (clear)	When illuminated, indicates filament voltage is applied to A and B magnetrons of the TRR system.
HIGH VOLTAGE—READY A indicator light	DS34	Green	When illuminated, indicates high voltage may be applied to the A transmitter of the TRR system.
HIGH VOLTAGE—READY B indicator light	DS33	Green	When illuminated, indicates high voltage may be applied to the B transmitter of the TRR system.
INTLK OVERRIDE switch	S5	Toggle (two-position, springloaded to down)	When operated to the on (up) position, all interlock switches in the TRR system are by passed, provided equipment within the ranging radar control cabinet is secured.
LINE VOLTAGE meter	M1		Indicates the magnitude of each phase of the three-phase input line voltage, as selected by the LINE VOLTS SEL switch. Scale is graduated from 0 to 150 volts in increments of 5 volts.
LINE VOLTS SEL switch	S1	Rotary (three-position)	Determines which phase (A, B, or C) of line voltage is monitored on the LINE VOLTAGE meter.
MAG SEL switch	S10	Toggle (two-position)	When set to A, selects the A magnetron and associated transmitter and receiver components of the TRR system, provided the TEST—OPERATE switch is set to TEST. When set to B, selects the B magnetron and associated transmitter and receiver components of the TRR system, provided the TEST—OPERATE switch is set to TEST.
METER ZERO variable resistors	R29 and R31	Rotary (dual control knob adjust)	When rotated, adjusts the NOISE OUTPUT meter to 0. The outer knob sets the meter when the NOISE OUTPUT switch is set to RADAR; the inner knob sets the meter when the NOISE OUTPUT switch is set to PAN.
MOD HV—A fuse indicator light	DS16	Red	When illuminated, indicates the associated fuse has blown.
MOD HV—B fuse indicator light	DS15	Red	When illuminated, indicates the associated fuse has blown.
NOISE LAMP fuse indicator light	DS7	Red	When illuminated, indicates the associated fuse has blown.
NOISE LAMP indicator light	DS42	Red	When illuminated, indicates the noise generator is functioning properly.
NOISE LAMP—ON switch	S14	Pushbutton	When depressed, applies primary power to the noise generator and illuminates the NOISE LAMP indicator light.
NOISE OUTPUT meter	M4		Indicates the noise level of the panoramic receiver or either of the two target range radar receivers, depending on the position of the NOISE OUTPUT switch, for checking receiver sensitivity.
NOISE OUTPUT switch	S16	Rotary (three-position)	When set to PAN, connects the noise meter to the pan receiver. When set to RADAR, connects the noise meter to the selected receiver of the TRR system.

Table 30 (U). Range Radar Power Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
PAN GAIN variable resistor	R25	Rotary (knob adjust)	When rotated, varies the gain of the panoramic receiver, provided the PAN GAIN switch is set to NOISE TEST.
PAN GAIN switch	S15	Toggle (two-position)	When set to NOISE TEST, permits the PAN GAIN knob to vary the gain of the panoramic receiver. When set to NORM, returns the panoramic receiver gain to a level determined by the gain control in the panoramic video detector unit.
PARALLAX OVERLOAD indicator light	DS41	Red	When illuminated, indicates that the parallax computer DC amplifier is overloaded.
PLATE VOLTAGE—INTLK indicator light	DS39	Amber	When illuminated, indicates TRR system interlock circuit is closed. When extinguished, indicates interlock circuit is opened.
PLATE VOLTAGE—ON indicator light	DS37	White	When illuminated, indicates plate voltage is applied to all circuits of the TRR system.
PLATE VOLTAGE—READY indicator light	DS38	Amber	When illuminated, indicates plate voltage may be applied to all circuits of the TRR system.
PLATE VOLTAGE switch	S3	Toggle (two-position)	When set to the on (up) position, performs the functions listed in *a* through *d* below. *a.* Applies plate voltage to all circuits of the TRR system. *b.* Illuminates PLATE VOLTAGE—ON indicator light. *c.* Illuminates HIGH VOLTAGE—READY A and HIGH VOLTAGE—READY B indicator lights, provided HIGH VOLTAGE—HOT indicator light is illuminated. *d.* Extinguishes PLATE VOLTAGE—READY indicator light.
PULSE switch	S19	Toggle (two-position)	Allows pulse width selection of TTR when TEST—OPERATE switch is set to TEST.
RADAR GAIN variable resistor	R21	Rotary (knob adjust)	When rotated, adjusts the gain of the TRR receiver system, provided the RADAR GAIN switch is set to MAN and the TEST—OPERATE switch is set to TEST.
RADAR GAIN switch	S12	Toggle (two-position)	When set to MAN, the receiver gain of the TRR system is controlled by the RADAR GAIN knob, provided the TEST—OPERATE switch is set to TEST. When set to LIN-LOG, the RADAR GAIN knob is disconnected from the receiver circuit of the TRR system.
RANGE ZERO switch	S9	Toggle (two-position)	When set to TEST, places the TRR system in the test condition to permit range zero checks and adjustments, provided TEST—OPERATE switch is set to TEST.
REC INPUT switch	S13	Toggle (two-position)	When set to NOISE LAMP, the receiver inputs are removed from the antenna and coupled to the noise generator. *a.* When the NOISE OUTPUT switch is set to PAN and the NOISE LAMP—ON switch is depressed, the noise generator output is applied to the panoramic receiver. *b.* When the NOISE OUTPUT switch is set to RADAR and the NOISE LAMP—ON switch is depressed, the noise generator output is applied to the selected target range radar receiver.
RECT. BIAS fuse indicator light	DS12	Red	When illuminated, indicates the associated fuse has blown.
RECTIFIER—+220V −250V fuse indicator light	DS4	Red	When illuminated, indicates the associated fuse has blown.
RECTIFIER—±320V fuse indicator light	DS5	Red	When illuminated, indicates the associated fuse has blown.

Table 30 (U). Range Radar Power Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
SPARE fuse indicator lights	DS1, DS2, DS29, and DS30	Red	Provides spares for emergency or addition to system.
STDBY PWR—FIL fuse indicator light	DS13	Red	When illuminated, indicates the associated fuse has blown.
STDBY PWR—UTILITY fuse indicator light	DS14	Red	When illuminated, indicates the associated fuse has blown.
TEST—OPERATE switch	S11	Toggle (two-position with guard)	When set to TEST, places the TRR system in the test condition and disables the switches listed in *a* and *b* below. *a.* The TRR—MAG A—MAG B switch on the remote transmitter control is disabled. *b.* The FREQ switch and the MAG SEL switch on the countermeasures control-indicator are disabled. When set to OPERATE, disables the controls listed in *a* through *g* below. *a.* METER ZERO knob *b.* RADAR GAIN knob *c.* MAG SEL switch *d.* PAN GAIN switch *e.* NOISE LAMP—ON switch *f.* REC INPUT switch *g.* TUNE switch
TRR POWER switch	S2	Toggle (two-position)	When set to ON, performs the functions listed in *a* through *d* below. *a.* Applies primary power to the TRR system. *b.* Illuminates the HIGH VOLTAGE—PREHEAT indicator light immediately. *c.* Illuminates PLATE VOLTAGE—READY indicator light in 20 to 30 seconds, provided low voltage interlocks are closed. *d.* Illuminates WAVEGUIDE PRESSURE indicator light.
TUNE switch	S8	Toggle (two-position)	When set to SLOW, permits slow tuning of the magnetron selected by the MAG SEL switch, provided TEST—OPERATE switch is set to TEST. When set to FAST, permits fast tuning of the magnetron, as selected by the MAG SEL switch.
WAVEGUIDE PRESSURE indicator light	DS40	White	When illuminated, indicates waveguide assembly of the TRR system is pressurized for proper operation.
VOLTS CHECK meter	M2		Indicates the value of the TRR system low voltage power supply output selected by the VOLTS CHECK switch. Scale is graduated in segments.
VOLTS CHECK switch	S4	Rotary (nine-position)	When set to any position except OFF, switches the TRR system low voltage power supply output, indicated by the switch setting, to the VOLTS CHECK meter for checking purposes.

88 (U). Target Radar Control Console

Note. The key numbers shown in parentheses in this paragraph refer to figure 32 unless otherwise indicated.

The controls and indicators of the target radar control console (9, fig. 28) are on the target track indicator assembly (10), countermeasures control-indicator (9), B scope indicator (19), target test control (15), target antenna control group (24), electric light control (25), elevation, azimuth, and target range indicators (26, 21, and 17), target track control-

power supply (22), and center access door (2). These controls and indicators are described in *a* through *i* below.

a. Target Track Indicator Assembly. The indicators of the target track indicator assembly (10) are described in table 31.

Table 31 (U). Target Track Indicator Assembly—Front Panel Indicators (U)

Control or indicator	Appar des	Type	Function
BURST indicator light	I12	Green	When illuminated, indicates the missile burst order has been issued.
BURST indicator light	I11	Ivory	When illuminated, indicates the missile burst order has not been issued.
CONFIRM indicator light	I4	Green	When illuminated, indicates the ACQUIRE switch has been operated and the designated target is being acquired by the TTR system.
CONFIRM indicator light	I3	Ivory	When illuminated, indicates no target has been acquired by the TTR system.
DESIGNATE indicator light	I2	Green	When illuminated, indicates target has been designated to the TTR system.
DESIGNATE indicator light	I1	Ivory	When illuminated, indicates a target has not been designated.
FIRE indicator light	I8	Green	When illuminated, indicates the missile fire order has been issued.
FIRE indicator light	I7	Ivory	When illuminated, indicates the missile fire order has not been issued.
HIPAR indicator light	DS14	Green	When illuminated, indicates that HIPAR system is supplying video signals to the PPI in the trailer mounted director station and to the B scope in the trailer mounted tracking station.
LAUNCH indicator light	I10	Green	When illuminated, indicates the computer has detected the launching of the missile.
LAUNCH indicator light	I9	Ivory	When illuminated, indicates the missile has not been launched.
LOPAR indicator light	DS13	Green	When illuminated, indicates that LOPAR system is supplying video signals to the PPI in the trailer mounted director station and to the B scope in the trailer mounted tracking station.
TRACK indicator light	I6	Green	When illuminated, indicates TRACKED pushbutton has been depressed and a designated target is being tracked.
TRACK indicator light	I5	Ivory	When illuminated, indicates no target is currently being tracked by the TTR system.

b. Countermeasures Control-Indicator. The controls and indicators of the countermeasures control-indicator (9) are described in table 32.

Table 32 (U). Countermeasures Control-Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
FREQ switch	S7	Toggle (two-position, springloaded to center)	When operated to INC or DEC, increases or decreases the frequency of the magnetron coupled to the dummy load.
MAG A—HV OFF switch	S4	Pushbutton	When depressed, removes high voltage from magnetron A, extinguishes MAG A—HV ON indicator light, and illuminates MAG A—READY indicator light.
MAG A—HV ON indicator light	DS4	Red	When illuminated, indicates high voltage is applied to magnetron A.

Table 32 (U). Countermeasures Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
MAG A—HV ON switch	S3	Pushbutton	When depressed, applies high voltage to magnetron A, extinguishes MAG A—READY indicator light, and illuminates MAG A—HV ON indicator light.
MAG A meter	M1		Indicates the modulator current, magnetron current, or modulator high voltage, depending on the position of the MAG A switch.
MAG A—READY indicator light	DS3	Green	When illuminated, indicates the filaments of magnetron A have reached the correct operating temperatures and high voltage may be applied.
MAG A switch	S1	Toggle (three-position, spring-loaded to center)	When operated to MOD HV, indicates modulator high voltage of magnetron A on the MAG A meter. When operated to MOD CUR, indicates modulator current of magnetron A on the MAG A meter. When released to MAG CUR, indicates magnetron A current on the MAG A meter.
MAG B—HV OFF switch	S6	Pushbutton	When depressed, removes high voltage from magnetron B, extinguishes MAG B—HV ON indicator light, and illuminates MAG B—READY indicator light.
MAG B—HV ON indicator light	DS6	Red	When illuminated, indicates high voltage is being applied to magnetron B.
MAG B—HV ON switch	S5	Pushbutton	When depressed, applies high voltage to magnetron B, extinguishes MAG B—READY indicator light, and illuminates MAG B—HV ON indicator light.
MAG B meter	M2		Indicates the modulator current, magnetron current, or modulator high voltage, depending on the position of the MAG B switch.
MAG B—READY indicator light	DS5	Green	When illuminated, indicates the filaments of magnetron B have reached an operating temperature and high voltage may be applied.
MAG B switch	S2	Toggle (three-position, spring-loaded to center)	When operated to MOD HV, indicates modulator high voltage of magnetron B on the MAG B meter. When operated to MOD CUR indicates modulator current of magnetron B on the MAG B meter. When released to MAG CUR, indicates magnetron B current on the MAG B meter.
MAG SEL switch	S8	Toggle (two-position)	When set to A, transmitter A radiates RF energy into space and RF energy from transmitter B is directed into a dummy load. When set to B, transmitter B radiates RF energy into space, and RF energy from transmitter A is directed into a dummy load.
MOD A HV variable resistor	R16	Rotary (knob adjust)	When rotated, adjusts the magnetron current of transmitter A.
MOD B HV variable resistor	R17	Rotary (knob adjust)	When rotated, adjusts the magnetron current of transmitter B.
PAN FOCUS variable resistor	R6	Rotary (knob adjust)	When rotated, adjusts the focus of the panoramic sweep.
PAN INTENSITY variable resistor	R3	Rotary (knob adjust)	When rotated, adjusts the brilliance of the panoramic sweep.
Panoramic scope	V1	Dual beam A scope	Displays panoramic video signals on the upper trace and target range video signals on the lower trace.
PAN switch	S9	Toggle (two-position)	When set to NORM, couples the panoramic receiver to the antenna through an attenuator. When set to NO LOSS, couples the panoramic receiver directly to the antenna, directs the output of both transmitters into dummy loads and applies a ground to the T1 trainer where it is used to indicate no-loss conditions during a simulated mission.

Table 32 (U). Countermeasures Control-Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
TEST indicator light	DS7	Red	When illuminated, indicates the TEST—OPERATE switch on the range radar power control-indicator is set to TEST, disabling the switches listed in *a* and *b* below. *a.* FREQ switch *b.* MAG SEL switch.
TRR FOCUS variable resistor	R10	Rotary (knob adjust)	When rotated, adjusts the focus of the TRR video sweep.
TRR INTENSITY variable resistor	R15	Rotary (knob adjust)	When rotated, adjusts the brilliance of TRR video sweep.

c. B Scope Indicator. The controls and indicators of the B scope indicator (19) are described in table 33.

Table 33 (C). B Scope Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
Cathode-ray tube	V2	B scope	Displays a section of the PPI presentation 220,000 yards in range and 60 degrees in azimuth.
GAIN variable resistor	R4	Rotary (knob adjust)	When rotated, adjusts the video gain on the B scope indicator.
INTENSITY variable resistor	R13	Rotary (knob adjust)	When rotated, adjusts the brilliance of the indicator sweep.
LIGHTS variable resistor	R8	Rotary (knob adjust)	When rotated, adjusts the brilliance of the range and azimuth graticule.
REFRAME switch	S1	Pushbutton	When depressed, causes the presentation to center about the azimuth of the TTR.

d. Target Test Control. The controls and indicators of the target test control (15) are described in table 34.

Table 34 (U). Target Test Control—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
FREQUENCY synchro	B2	Rotary push-to-turn (knob adjust)	When pushed and turned, adjusts the transmitting frequency of the target oscillator in the radar test set, provided the TARGET—STANDBY—MISSILE switch on the missile control-indicator group is set to TARGET.
RANGE—TRIM variable resistor	R1	Rotary (knob adjust)	When rotated, permits fine adjustment of the simulated range of the RF signal produced by the target oscillator in the radar test set.
RANGE—SLEW switch	S1	Toggle (three-position, spring-loaded to center)	When operated to OUT, increases the simulated range of the RF signal produced by the target oscillator in the radar test set. When operated to IN, decreases the simulated range of the RF signal produced by the target oscillator in the radar test set.
RECEIVER TEST indicator light	I2	Red	When illuminated, indicates TARGET—STANDBY—MISSILE switch on the missile control-indicator group is set to TARGET. Indicates that the target oscillator of the radar test set group is selected for testing the receiver system of the TTR system.

Table 34 (U). Target Test Control—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
SIGNAL LEVEL dial			Indicates the attenuation of the transmitted signal from the target oscillator of the radar test set. Dial is graduated from 0 to 35 db in increments of 1 db.
SIGNAL LEVEL synchro	B1	Rotary (knob adjust)	When rotated, adjusts the attenuation of the transmitted signal from the target oscillator of the radar test set as indicated by the SIGNAL LEVEL dial.

c. Target Antenna Control Group. The controls of the target antenna control group (24) are described in table 35. The nonplacarded controls are shown in figure 56.

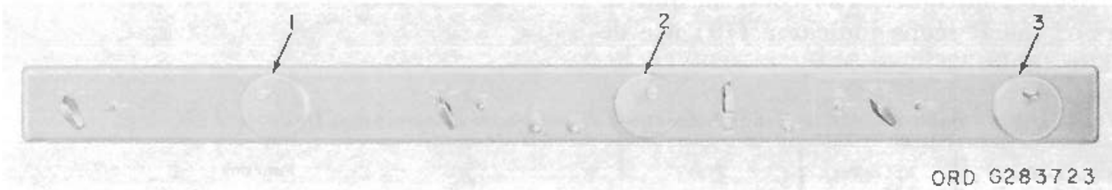


Figure 56 (U). Target antenna control group—nonplacarded controls (U).

Table 35 (U). Target Antenna Control Group—Front Panel Controls (U)

Control or indicator	Appar des	Type	Function	Key to fig. 56
			Note. The TRR is slaved in elevation and azimuth to the TTR; therefore, elevation and azimuth controls affecting the TTR in these coordinates also affect the TRR.	
ACQUIRE switch	S5	Toggle (three-position, springloaded to center)	When operated, performs the functions listed in *a* through *d* below. *a.* Automatically slews the azimuth and range circuits of the TTR system to the azimuth and range of the designated target. *b.* Illuminates the green CONFIRM indicator light on the target track indicator assembly and extinguishes the ivory CONFIRM indicator light. *c.* The green TARGET CONFIRM indicator on the battery signal panel-indicator illuminates. *d.* Reframes B scope indicator presentation about the azimuth coordinate of the TTR system.	
AGC—LIN-LOG switch	S28	Toggle (two-position)	When set to AGC, the TTR video is coupled through the receiver gate generator for presentation on the azimuth, elevation, and range indicators. When set to LIN-LOG, the lin-log video is coupled through the receiver gate generator for presentation on the azimuth, elevation, and range indicators.	
Azimuth handwheel		Rotary	When rotated, positions both the track antenna reflector assembly and the range antenna reflector in azimuth, provided the azimuth MAN—AID—AUTO switch is set to either MAN or AID.	2

Table 35 (U). Target Antenna Control Group—Front Panel Controls—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 56
Azimuth MAN—AID—AUTO switch	S9	Rotary (three-position)	When set to MAN, the track antenna reflector assembly and the range antenna reflector of the TTR and TRR systems, respectively, are positioned in azimuth at a rate proportional to the manual rotation of the azimuth handwheel. When set to AID, the track antenna reflector assembly and the range antenna reflector of the TTR and TRR systems, respectively, continue to move in azimuth after release of the azimuth handwheel. The rate and direction at which	

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Table 35 (U). Target Antenna Control Group—Front Panel Controls—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 56
Azimuth MAN—AID—AUTO switch—Continued			the track antenna reflector assembly and the range antenna reflector move remain the same as they were at the time the azimuth handwheel was stopped. When set to AUTO, the track antenna reflector assembly and the range antenna reflector of the TTR and TRR systems, respectively, automatically track the gated target in the azimuth coordinate.	
Elevation handwheel		Rotary	When rotated, positions the track antenna reflector assembly and the range antenna reflector of the TTR and TRR systems, respectively, up or down in elevation, provided the elevation MAN—AID—AUTO switch is set to either MAN or AID.	1
Elevation MAN—AID—AUTO switch	S8	Rotary (three-position)	When set to MAN, the track antenna reflector assembly and the range antenna reflector of the TTR and TRR systems, respectively, are positioned up or down in elevation at a rate directly proportional to the manual rotation of the elevation handwheel. When set to AID, the track antenna reflector assembly and the range antenna reflector of the TTR and TRR systems, respectively, automatically move up and down in elevation after release of the elevation handwheel. The rate and direction of movement of the track antenna reflector assembly and the range antenna reflector remain the same as they were at the time the elevation handwheel was stopped. When set to AUTO, the track antenna reflector assembly and the range antenna reflector of the TTR and TRR systems, respectively, automatically track the gated target in the elevation coordinate.	
Elevation SLEW switch	S6	Toggle (three-position, springloaded to center)	When operated, moves the track antenna reflector assembly and the range antenna reflector of the TTR and TRR systems, respectively, up or down in elevation.	
OFF TARGET switch	S2	Pushbutton	When depressed, performs the functions listed in *a* and *b* below, which indicate that the TTR system is off target in at least one coordinate. *a.* Illuminates the ivory TRACK indicator light and extinguishes the green TRACK indicator light on the target track indicator assembly. *b.* The ivory TARGET—TRACKED indicator light on the battery signal panel-indicator illuminates and the green TARGET—TRACKED indicator light extinguishes.	
Range handwheel		Rotary	When rotated, the target range represented by the range circuits of the TTR and TRR systems increases or decreases, provided the range MAN—ACQUIRE AID—TRACK AID—AUTO switch is set to either MAN, ACQUIRE AID, or TRACK AID.	3

Table 35 (U). Target Antenna Control Group—Front Panel Controls—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 56
Range MAN—ACQUIRE AID—TRACK AID—AUTO switch	S10	Rotary (four-position, push-to-turn)	When set to MAN, permits target range to be increased or decreased at a rate proportional to the rotation of the range handwheel. When set to ACQUIRE AID, requires less displacement of the range handwheel to set in a given displacement of the range unit than is required in the track aid mode. One revolution of the handwheel sets in a displacement of 2,100 yards per second in the range unit. The ACQUIRE AID position is used when tracking targets on the B scope indicator. When set to TRACK AID and the range handwheel is rotated, the target range continues to increase or decrease at the same rate and in the same direction as that of the range handwheel at the time manual rotation was discontinued. Long and short pulse operations, while in the track aid mode, are given in *a* and *b* below. *a.* When in long pulse operation, one revolution of the handwheel sets in a displacement of 700 yards per second in the range unit. *b.* When in short pulse operation, one revolution of the handwheel sets in a displacement of 175 yards per second in the range unit. When set to AUTO, the TTR or TRR system locks on and automatically tracks the designated target.	
Range SLEW switch	S7	Toggle (three-position, springloaded to center)	When operated, the range circuits of the TTR system slew in or out in range at a more rapid rate than is provided by rotating the range handwheel.	
RANGE switch	S3	Toggle (three-position)	When set to NORMAL, permits normal operation of the range circuits of the TTR system. When set to CALIBRATE, permits calibration of the range circuits of the TTR system. When set to ZERO, permits zeroing of the range circuits of the TTR system.	
RANGE TRACK switch	S25	Toggle (two-position)	When set to TTR, employs TTR system for determining azimuth, elevation, and range positioning data of the target for the computer system. When set to TRR, employs the TRR system for determining range and the TTR system for determining azimuth and elevation positioning data of the target for the computer system.	
SERVOS switch	S13	Toggle (three-position)	When set to INC, applies a constant automatic tracking rate in a positive direction to the azimuth and elevation servos of the TTR and TRR systems for use during testing. When set to DEC, applies a constant automatic tracking rate in a negative direction to the azimuth and elevation servos of the TTR and TRR systems for use during testing. When set to NORMAL from either DEC or INC, disables SERVOS switch and enables normal operation of servo circuits.	

Table 35 (U). Target Antenna Control Group—Front Panel Controls—Continued (U)

Control or indicator	Appar des	Type	Function	Key to fig. 56
TEST switch	S12	Toggle (two-position, with guard)	When set to TEST, places the TTR system in the test condition. When set to off (down), permits normal operation of the TTR system. Switch is normally left in down position.	
TRACKED switch	S1	Pushbutton	When depressed, performs the functions listed in *a* and *b* below, which indicate that the TTR system is on target in all three coordinates. *a.* Illuminates green TRACK indicator light and extinguishes ivory TRACK indicator light on the target track indicator assembly. *b.* TARGET—TRACKED green indicator light on the battery signal panel-indicator illuminates and the ivory TARGET—TRACKED indicator light extinguishes.	

f. Electric Light Control. The controls of the electric light control (25) are described in table 36.

Table 36 (U). Electric Light Control—Front Panel Controls (U)

Control or indicator	Appar des	Type	Function
CEILING LIGHTS variable transformer	T1	Rotary (knob adjust)	When rotated, adjusts the brilliance of the white incandescent ceiling lights, provided CEILING LIGHTS switch is set to DIM, and CEILING LIGHTS switch on the trailer door light panel is set to REMOTE.
CEILING LIGHTS switch	S1	Toggle (two-position)	When set to BRIGHT, illuminates all white incandescent ceiling lights at full brilliance, provided CEILING LIGHTS switch on trailer door light panel is set to REMOTE. When set to DIM, permits brilliance of white incandescent ceiling lights to be controlled by CEILING LIGHTS knob, provided CEILING LIGHTS switch on trailer door light panel is set to REMOTE.
COORDINATE LOCK—AZ switch	S3	Toggle (two-position)	When set to on (up) position, locks azimuth antenna positioning circuits during an S–S mission. When set to off (down) position, enables azimuth antenna positioning circuits.
COORDINATE LOCK—ELEV switch	S4	Toggle (two-position)	When set to on (up) position, locks elevation antenna positioning circuits during an S–S mission. When set to off (down) position, enables elevation antenna positioning circuits.
COORDINATE LOCK—RANGE switch	S2	Toggle (two-position)	When set to on (up) position, locks range antenna positioning circuits during an S–S mission. When set to off (down) position, enables range antenna positioning circuits.
DIAL LIGHTS variable resistor	R1	Rotary (knob adjust)	When rotated, adjusts the illumination of the azimuth dial, elevation dial, and range dial on the azimuth indicator, elevation indicator, and target range indicator, respectively.
SIGNAL LIGHTS variable resistor	R3	Rotary (knob adjust)	When rotated, adjusts the brilliance of all indicator lights on the target track indicator assembly.

g. Elevation, Azimuth, or Target Range Indicator. The controls and indicators of the elevation, azimuth, and target range indicators (26, 21, and 17) are described in table 37. The controls on each indicator are identical and perform the same functions with respect to their associated indicators. Therefore, each control is described only once in table 37. Since the dial on each of these indicators is different, the dial for each indicator is described separately in table 37.

Table 37 (C). Elevation, Azimuth, or Target Range Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
Elevation, azimuth, or range dial			Elevation dial indicates the elevation angle of the track antenna reflector assembly of the target track antenna-receiver-transmitter group. The dial is graduated from 0 to 6,400 mils in increments of 5 mils. Azimuth dial indicates the azimuth angle of the track antenna reflector assembly of the target track antenna-receiver-transmitter group. The dial is graduated from 0 to 6,400 mils in increments of 5 mils. *Note.* The TRR is slaved in azimuth and elevation to the TTR; therefore, controls affecting the TTR in these coordinates also affect the TRR. Range dial indicates the target range represented by the range circuits of the TTR system. The dial is graduated from 0 to 200,000 yards in increments of 10 yards.
Elevation, azimuth, or target range indicator scope	V1	A scope	Provides the operator with target information necessary for tracking the target in elevation, azimuth, and range.
FOCUS variable resistor	R6	Rotary (knob adjust)	When rotated, adjusts clearness and sharpness of the indicator presentation.
PRESENTATION switch (elevation indicator only)	S1	Rotary (two-position)	When set to H_T position, the height scale is illuminated and superimposed on the face of the scope to indicate the altitude of the target. When set to the NOR position, removes the hight scale from the face of the scope.
IMAGE SPACING switch (azimuth and target range indicators)	S1	Rotary (three-position)	The positions of the switch are strapped together and no longer serve any functional purpose.
INTENSITY variable resistor	R4	Rotary (knob adjust)	When rotated, adjusts the brilliance of the indicator presentation.
SWEEP LENGTH variable resistor	R3	Rotary (knob adjust)	When rotated, varies the range represented on the sweep from a minimum of 40,000 yards to a maximum of 200,000 yards on the upper sweep of the elevation or azimuth indicator presentation or on both sweeps for the range indicator presentation. This knob is disabled when IND switch on the target track control-power supply is set to R

h. Target Track Control-Power Supply. The controls and indicators of the target track control-power supply (22) are described in table 38.

Table 38 (C). Target Track Control-Power Supply—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
AGC switch	S7	Toggle (two-position)	When set to AGC, causes the automatic gain control (AGC) circuits to automatically control the gain of the receiver system of the TTR system. When set to MANUAL, permits the gain of the receiver system of the TTR system to be controlled by the GAIN knob, provided the TEST switch on target antenna con trol group is set to TEST.

Table 35 (U). Target Antenna Control Group—Front Panel Controls—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 56
TEST switch	S12	Toggle (two-position, with guard)	When set to TEST, places the TTR system in the test condition. When set to off (down), permits normal operation of the TTR system. Switch is normally left in down position.	
TRACKED switch	S1	Pushbutton	When depressed, performs the functions listed in *a* and *b* below, which indicate that the TTR system is on target in all three coordinates. *a.* Illuminates green TRACK indicator light and extinguishes ivory TRACK indicator light on the target track indicator assembly. *b.* TARGET—TRACKED green indicator light on the battery signal panel-indicator illuminates and the ivory TARGET—TRACKED indicator light extinguishes.	

f. Electric Light Control. The controls of the electric light control (25) are described in table 36.

Table 36 (U). Electric Light Control—Front Panel Controls (U)

Control or indicator	Appar des	Type	Function
CEILING LIGHTS variable transformer	T1	Rotary (knob adjust)	When rotated, adjusts the brilliance of the white incandescent ceiling lights, provided CEILING LIGHTS switch is set to DIM, and CEILING LIGHTS switch on the trailer door light panel is set to REMOTE.
CEILING LIGHTS switch	S1	Toggle (two-position)	When set to BRIGHT, illuminates all white incandescent ceiling lights at full brilliance, provided CEILING LIGHTS switch on trailer door light panel is set to REMOTE. When set to DIM, permits brilliance of white incandescent ceiling lights to be controlled by CEILING LIGHTS knob, provided CEILING LIGHTS switch on trailer door light panel is set to REMOTE.
COORDINATE LOCK—AZ switch	S3	Toggle (two-position)	When set to on (up) position, locks azimuth antenna positioning circuits during an S–S mission. When set to off (down) position, enables azimuth antenna positioning circuits.
COORDINATE LOCK—ELEV switch	S4	Toggle (two-position)	When set to on (up) position, locks elevation antenna positioning circuits during an S–S mission. When set to off (down) position, enables elevation antenna positioning circuits.
COORDINATE LOCK—RANGE switch	S2	Toggle (two-position)	When set to on (up) position, locks range antenna positioning circuits during an S–S mission. When set to off (down) position, enables range antenna positioning circuits.
DIAL LIGHTS variable resistor	R1	Rotary (knob adjust)	When rotated, adjusts the illumination of the azimuth dial, elevation dial, and range dial on the azimuth indicator, elevation indicator, and target range indicator, respectively.
SIGNAL LIGHTS variable resistor	R3	Rotary (knob adjust)	When rotated, adjusts the brilliance of all indicator lights on the target track indicator assembly.

g. Elevation, Azimuth, or Target Range Indicator. The controls and indicators of the elevation, azimuth, and target range indicators (26, 21, and 17) are described in table 37. The controls on each indicator are identical and perform the same functions with respect to their associated indicators. Therefore, each control is described only once in table 37. Since the dial on each of these indicators is different, the dial for each indicator is described separately in table 37.

Table 37 (C). Elevation, Azimuth, or Target Range Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
Elevation, azimuth, or range dial			Elevation dial indicates the elevation angle of the track antenna reflector assembly of the target track antenna-receiver-transmitter group. The dial is graduated from 0 to 6,400 mils in increments of 5 mils. Azimuth dial indicates the azimuth angle of the track antenna reflector assembly of the target track antenna-receiver-transmitter group. The dial is graduated from 0 to 6,400 mils in increments of 5 mils. *Note.* The TRR is slaved in azimuth and elevation to the TTR; therefore, controls affecting the TTR in these coordinates also affect the TRR. Range dial indicates the target range represented by the range circuits of the TTR system. The dial is graduated from 0 to 200,000 yards in increments of 10 yards.
Elevation, azimuth, or target range indicator scope	V1	A scope	Provides the operator with target information necessary for tracking the target in elevation, azimuth,and range.
FOCUS variable resistor	R6	Rotary (knob adjust)	When rotated, adjusts clearness and sharpness of the indicator presentation.
IMAGE SPACING switch	S1	Rotary (three-position)	The positions of this switch are strapped together and no longer serve any functional purpose in the Improved NIKE-HERCULES System.
INTENSITY variable resistor	R4	Rotary (knob adjust)	When rotated, adjusts the brilliance of the indicator presentation.
SWEEP LENGTH variable resistor	R3	Rotary (knob adjust)	When rotated, varies the range represented on the sweep from a minimum of 40,000 yards to a maximum of 200,000 yards on the upper sweep of the elevation or azimuth indicator presentation or on both sweeps for the range indicator presentation. This knob is disabled when IND switch on the target track control-power supply is set to R.

h. Target Track Control-Power Supply. The controls and indicators of the target track control-power supply (22) are described in table 38.

Table 38 (C). Target Track Control-Power Supply—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
AGC switch	S7	Toggle (two-position)	When set to AGC, causes the automatic gain control (AGC) circuits to automatically control the gain of the receiver system of the TTR system. When set to MANUAL, permits the gain of the receiver system of the TTR system to be controlled by the GAIN knob, provided the TEST switch on target antenna control group is set to TEST.

Table 38 (C). Target Track Control-Power Supply—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
FREQUENCY meter	M2		Indicates the relative frequency at which the magnetron of the TTR system is operating. The meter is graduated from 0 to 100 units in increments of 5 units.
FREQUENCY switch	S6	Toggle (three-position, springloaded to center)	When operated to DECREASE, decreases the frequency of the magnetron of the TTR system to a minimum of 8,500 mc. When operated to INCREASE, increases the frequency of the magnetron of the TTR system to a maximum of 9,600 mc.
GAIN variable resistor	R9	Rotary (knob adjust)	When rotated, adjusts the gain of the TTR receiver system, provided the AGC switch is set to MANUAL.
HV SUPPLY variable transformer	T3	Rotary (knob adjust)	When rotated, adjusts high voltage applied to the transmitter system of the TTR system, as indicated on the MAGNETRON meter. (Must be in START position, fully ccw, before high voltage can be applied to the transmitter system).
HV SUPPLY—OFF switch	S2	Pushbutton	When depressed, removes high voltage from the transmitter system of the TTR system. Extinguishes HV SUPPLY—ON indicator light on the target track control-power supply and TARGET—HIGH VOLTS—ON indicator light on the radar power control-indicator. Illuminates HV SUPPLY—READY indicator light on the target track control-power supply, and illuminates the indicator lights on the radar power control-indicator listed in *a* through *d* below. *a.* TARGET—HIGH VOLTS—READY *b.* TARGET—HIGH VOLTS—HOT *c.* TARGET—HIGH VOLTS—PREHEAT *d.* TARGET—INTLK
HV SUPPLY—ON indicator light	DS3	Red	When illuminated, indicates that high voltage is applied to the transmitter system of the TTR system.
HV SUPPLY—ON switch	S4	Pushbutton	When depressed, applies high voltage to the transmitter system of the TTR system. Illuminates HV SUPPLY—ON indicator light on the target track control-power supply and the TARGET—HIGH VOLTS—ON indicator light on the radar power control-indicator. Extinguishes the HV SUPPLY—READY indicator light on the target track control-power supply, and extinguishes the indicator lights on the radar power control-indicator listed in *a* through *d* below. *a.* TARGET—HIGH VOLTS—READY *b.* TARGET—HIGH VOLTS—HOT *c.* TARGET—HIGH VOLTS—PREHEAT *d.* TARGET—INTLK
HV SUPPLY—READY indicator light	DS2	Green	When illuminated, indicates that high voltage may be applied to the transmitter system of the TTR system.
IND HV indicator light	DS1	White	When illuminated, indicates that high voltage is applied to the elevation indicator, azimuth indicator, target range indicator, B scope indicator, and countermeasures control-indicator on the target radar control console.
IND HV switch	S1	Toggle (two-position)	When set to on (up) position, applies high voltage to the countermeasures control-indicator, B scope indicator, target range indicator, elevation indicator, and azimuth indicator on the target radar control console; and illuminates the IND HV indicator light.
IND switch	S10	Toggle (two-position)	When set to A, displays a range of 200,000 yards on the azimuth, elevation, and target range indicators. When set to R, displays 40,000 yards of range centered about the range notch. The R position is normally used by the tracking operator during tracking operation.

Table 38 (C). Target Track Control-Power Supply—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
MAGNETRON meter	M1		The meter has two scales. The top scale is graduated from 0 to 100 in increments of 5; the lower scale is graduated from 0 to 20 in increments of 1. The meter indications are described in the discussion of the MAGNETRON switch below.
MAGNETRON switch	S5	Toggle (three-position, springloaded to center)	When operated to KV FS=20, the MAGNETRON meter indicates the magnitude of high voltage applied to the magnetron of the transmitter system of the TTR system. The magnitude is indicated on the lower scale of the meter. The scale is graduated from 0 to 20 representing 0 to 20,000 volts, in increments of 1 representing 1,000 volts. When released from either KV FS=20 or MA FS=100 to FS 20MA, the MAGNETRON meter indicates the average current of the magnetron of the transmitter system of the TTR system. Current is indicated in milliamperes on the lower scale of the meter. Scale is graduated from 0 to 20 ma in increments of 1 ma. When operated to MA FS=100, the MAGNETRON meter indicates average current of the magnetron high voltage power supply of the TTR system. Current is indicated in milliamperes on the lower scale of the meter. Scale is graduated from 0 to 100 ma in increments of 5 ma.
PULSE switch	S8	Toggle (two-position)	When set to LONG, conditions the TRR system for long pulse operation. Also, conditions the TTR system for long pulse operation if the TTR PULSE WIDTH switch is set to ENABLE (override). When set to SHORT, conditions the TRR system for short pulse operation. Also, conditions the TTR system for short pulse operation if the TTR PULSE WIDTH switch is set to ENABLE (override).
RF switch	S9	Toggle (three-position, springloaded to center)	When operated to INTERRUPT (left or right from center), the TTR transmitter signal is applied to a dummy load. The RF switch is discussed in TM 9-1430-250-10/3.
TTR PULSE WIDTH switch	S11	Toggle (two-position, with guard)	When set to off (down) position, conditions the TTR system for long pulse operation (normal operating mode). When set to ENABLE (override), enables the pulse mode (long or short pulse) to be controlled by the PULSE switch.

i. Center Access Door. The indicators on the center access door (2) are described in table 39. The nonplacarded indicators are shown on figure 32.

Table 39 (U). Target Radar Control Console—Center Access Door—Front Panel Indicators (U)

Control or indicator	Appar des	Type	Function	Key to fig. 32
Equipment status indicator light	DS15	Blue	When illuminated, indicates blue equipment status prevails.	5
Equipment status indicator light	DS16	Red	When illuminated, indicates red equipment status prevails.	6
Equipment status indicator light	DS13	White	When illuminated, indicates white equipment status prevails.	3
Equipment status indicator light	DS14	Yellow	When illuminated, indicates yellow equipment status prevails. *Note.* For the Improved NIKE-HERCULES System the yellow status indicator light has no tactical significance.	4

89 (C). Radar Set Group and Remote Transmitter Control

a. Radar Set Group. The indicators of the radar set group (5, fig. 28) are viewed through two glass apertures. The target range and missile range dials (4 and 7, fig. 31) are described in table 40.

Table 40 (C). Radar Set Group—Front Panel Indicators (U)

Control or indicator	Appar des	Type	Function	Key to fig. 31
Missile range dial			Indicates missile slant range. Dial is graduated from 0 to 200,000 yards in increments of 2 yards.	7
Target range dial			Indicates target slant range. Dial is graduated from 0 to 200,000 yards in increments of 2 yards.	4

b. Remote Transmitter Control. The controls of the remote transmitter control (3, fig. 31) are on the right side of the radar set group. These controls are described in table 41.

Table 41 (C). Remote Transmitter Control—Front Panel Controls (U)

Control or indicator	Appar des	Type	Function
DIMMER variable resistor	R1	Rotary (knob adjust)	When rotated, adjusts brilliance of panel lettering.
IND switch	S7	Lever (two-position)	When depressed to A, the range presentations on the elevation, azimuth, and target range indicators represent a minimum of 40,000 yards and a maximum of 200,000 yards. When depressed to R, the range presentations on the elevation, azimuth and target range indicators represent approximately 40,000 yards centered about the range notch.
LOC—REM switch	S1	Lever (two-position)	When depressed to LOC, transfers controls of circuits in the TTR and TRR from the target track control-power supply and countermeasures control-indicator to the remote transmitter control. When depressed to REM, transfers control of circuits in the TTR and TRR from the remote transmitter control to the target track control-power supply and countermeasures control-indicator.
PAN switch	S5	Lever (two-position, springloaded to NORM)	When operated to NO LOSS, applies the RF output of both TRR transmitters into dummy loads. A ground is applied to the T1 trainer where it is used to indicate no-loss conditions during a simulated mission. When released to NORM, the RF output of the selected magnetron is removed from the dummy load and radiated by the range antenna reflector.
TRR—FREQ switch	S3	Lever (three-position, springloaded to center)	When operated to DECR, decreases the frequency of the unselected magnetron of the TRR system to a minimum of 15,700 mc. When operated to INCR, increases the frequency of the unselected magnetron of the TRR system to a maximum of 17,500 mc.
TRR—MAG switch	S4	Lever (two-position)	When operated to either A or B, selects the designated magnetron for operation and applies the output of the alternate magnetron to a dummy load.
TRR—PULSE switch	S2	Lever (two-position)	When operated, selects either the short or long pulse mode of operation for the TRR system. Also, controls the pulse mode for the TTR system if the TTR PULSE WIDTH switch is set to ENABLE (override).

Table 41 (C). Remote Transmitter Control—Front Panel Controls—Continued *(U)*

Control or indicator	Appar des	Type	Function
TTR—FREQ switch	S6	Lever (three-position, springloaded to center)	When operated to DECR, decreases the operating frequency of the TTR system to a minimum of 8,500 mc. When operated to INCR, increases the operating frequency of the TTR system to a maximum of 9,600 mc.
TTR—RF switch	S9	Lever (three-position, springloaded to center)	When operated either to the left or right, applies the RF output of the TTR transmitter into a dummy load. When released either from the left or right, the RF output is removed from the dummy load and radiated by the track antenna reflector assembly.

90 (U). Missile Radar Control Console

Note. The key numbers shown in parentheses in this paragraph refer to figure 30 unless otherwise indicated.

The controls and indicators of the missile radar control console (3, fig. 28) are on the missile track indicator (11), missile track control drawer (9), missile track control power supply (7), missile control-indicator group (12), and range indicator (10). These controls and indicators are described in *a* through *e* below.

a. Missile Track Indicator. The controls and indicators of the missile track indicator (11) are described in table 42.

Table 42 (U). Missile Track Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
AZIMUTH dial			Indicates the azimuth angle of the track antenna reflector assembly of the missile track antenna-receiver-transmitter group. The dial is graduated from 0 to 6,400 mils in increments of 5 mils.
AZIMUTH ERROR meter	M1		Indicates azimuth pointing error of the track antenna reflector assembly of the missile track antenna-receiver-transmitter group. Meter is graduated from 0 to 25 mils to left and right of 0 in increments of 1 mil. When pointer of meter is to left of 0, indicates track antenna reflector assembly is pointing to the left of the missile. When pointer of meter is to right of 0, indicates the track antenna reflector assembly is pointing to the right of the missile.
DIAL LIGHTS variable resistor	R3	Rotary (knob adjust)	When turned, adjusts the illumination of AZIMUTH dial, ELEVATION dial, and range dial on the range indicator.
ELEVATION dial			Indicates the elevation angle of the track antenna reflector assembly of the missile track antenna-receiver-transmitter group. The dial is graduated from 0 to 6,400 mils in increments of 5 mils.
ELEVATION ERROR meter	M2		Indicates elevation pointing error of the track antenna reflector assembly of the missile track antenna-receiver-transmitter group. Meter is graduated from 0 to 25 mils to left and right of 0 in increments of 1 mil. When pointer of meter is to left of 0, indicates track antenna reflector assembly is pointing below the missile. When pointer of meter is to right of 0, indicates track antenna reflector assembly is pointing above the missile.
LAUNCHER—1 indicator light	I1	Green	When illuminated, indicates launcher 1 of the previously designated section has been designated.
LAUNCHER—1 switch	S1	Pushbutton	When depressed, designates launcher 1 of the previously selected section and illuminates LAUNCHER—1 indicator light, provided LOCAL DESIGNATE switch is set to the up position.

Table 42 (U). Missile Track Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
LAUNCHER—2 indicator light	I2	Green	When illuminated, indicates launcher 2 of the previously designated section has been designated.
LAUNCHER—2 switch	S2	Pushbutton	When depressed, designates launcher 2 of the previously selected section and illuminates LAUNCHER—2 indicator light, provided LOCAL DESIGNATE switch is set to the up position.
LAUNCHER—3 indicator light	I3	Green	When illuminated, indicates launcher 3 of the previously designated section has been designated.
LAUNCHER—3 switch	S3	Pushbutton	When depressed, designates launcher 3 of the previously selected section and illuminates LAUNCHER—3 indicator light, provided LOCAL DESIGNATE switch is set to the up position.
LAUNCHER—4 indicator light	I4	Green	When illuminated, indicates launcher 4 of the previously designated section has been designated.
LAUNCHER—4 switch	S4	Pushbutton	When depressed, designates launcher 4 of the previously selected section and illuminates LAUNCHER—4 indicator light, provided LOCAL DESIGNATE switch is set to the up position.
LOCAL DESIGNATE switch	S10	Toggle (two-position)	When set to the up position, permits section and launcher to be designated by the operation of a SECTION switch and a LAUNCHER switch, respectively.
MISSILE READY switch	S11	Toggle (two-position)	When turned to the up position, performs the functions listed in *a* and *b* below, which indicate that the designated missile is sufficiently conditioned to be tracked, provided the LOCAL DESIGNATE switch is in the up position. *a.* Illuminates the green READY indicator light and extinguishes the ivory READY indicator light on the missile control-indicator group. *b.* The green MISSILE—READY indicator light on the battery signal panel-indicator illuminates and the ivory MISSILE—READY indicator light extinguishes.
SECTION—A indicator light	I5	Green	When illuminated, indicates launching section A has been designated.
SECTION—A switch	S5	Pushbutton	When depressed, designates launching section A and illuminates SECTION—A indicator light, provided LOCAL DESIGNATE switch is set to the up position.
SECTION—B indicator light	I6	Green	When illuminated, indicates launching section B has been designated.
SECTION—B switch	S6	Pushbutton	When depressed, designates launching section B and illuminates SECTION—B indicator light, provided LOCAL DESIGNATE switch to set to the up position.
SECTION—C indicator light	I7	Green	When illuminated, indicates launching section C has been designated.
SECTION—C switch	S7	Pushbutton	When depressed, designates launching section C and illuminates SECTION—C indicator light provided LOCAL DESIGNATE switch is set to the up position.
SECTION—D indicator light	I8	Green	When illuminated, indicates launching section D has been designated.
SECTION—D switch	S8	Pushbutton	When depressed, designates launching section D and illuminates SECTION—D indicator light, provided LOCAL DESIGNATE switch is set to the up position.
SIGNAL LIGHTS variable resistor	R1	Rotary (knob adjust)	When rotated, adjusts the brilliance of all indicator lights on the missile track indicator. Adjusts the brilliance of all indicator lights on the missile control-indicator group except the RECEIVER TEST indicator light.

Table 42 (U). Missile Track Indicator—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
TEST RESPONDER indicator light	I9	Ivory	When illuminated, indicates flight simulator group is designated instead of a missile for tracking by the MTR system.
TEST RESPONDER switch	S9	Pushbutton	When depressed, performs the functions listed in *a* through *e* below, provided LOCAL DESIGNATE switch is set to the up position. *a.* Illuminates TEST RESPONDER indicator light, indicating the flight simulator group is to be used with the MTR system. *b.* Extinguishes the SECTION indicator light and the LAUNCHER indicator light. *c.* Extinguishes green DESIGNATE, READY, and TRACK indicator lights; and illuminates ivory DESIGNATE, READY, and TRACK indicator lights on the missile control-indicator group. *d.* The green MISSILE — DESIGNATE, MISSILE — READY, and MISSILE—TRACKED indicator lights on the battery signal panel-indicator illuminate. *e.* Causes the MTR system to automatically acquire and track the flight simulator group, provided TEST switch is set to off (down) position.

b. Missile Track Control Drawer. The controls and indicators of the missile track control drawer (9) are described in table 43. The nonplacarded controls are shown on figure 57.

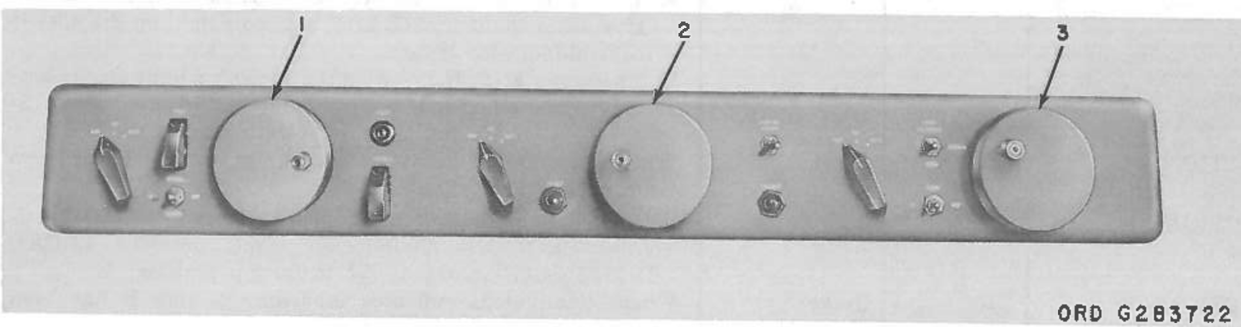


Figure 57 (U). Missile track control drawer—nonplacarded controls (U).

Table 43 (U). Missile Track Control Drawer—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function	Key to fig. 57
Azimuth handwheel		Rotary	When rotated, the track antenna reflector assembly of the MTR system is positioned in azimuth, provided the azimuth MAN—AID—AUTO switch is set to either MAN or AID, and the TEST switch is set to TEST.	2
Azimuth MAN—AID—AUTO switch	S9	Rotary (three-position)	When set to MAN, the track antenna reflector assembly of the MTR system is positioned in azimuth at a rate directly proportional to the manual rotation of the azimuth handwheel, provided the TEST switch is set to TEST.	

Table 43 (U). Missile Track Control Drawer—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 57
Azimuth MAN—AID—AUTO switch—Continued			When set to AID, the track antenna reflector assembly of the MTR system continues to move automatically in azimuth after release of the azimuth handwheel, provided the TEST switch is set to TEST. The rate and direction at which the track antenna reflector assembly moves remain the same as they were at the time the azimuth handwheel was released. When set to AUTO, the track antenna reflector assembly of the MTR system is automatically positioned to the azimuth angle of the object being tracked, provided the TEST switch is set to TEST.	
COAST indicator light	DS1	Red	When illuminated, indicates that a received signal is not within the 100-yard range notch on the range indicator.	
DISABLE switch	S2	Toggle (two-position, with guard)	When set to the up position, disables the coast circuit of the MTR system. When set to the down position, enables the coast circuit of the MTR system.	
Elevation handwheel		Rotary	When rotated, the track antenna reflector assembly of the MTR system is positioned in elevation, provided the elevation MAN—AID—AUTO switch is set to either MAN or AID, and the TEST switch is set to TEST.	1
Elevation MAN—AID—AUTO switch	S8	Rotary (three-position)	When set to MAN, the track antenna reflector assembly of the MTR system is positioned in elevation at a rate directly proportional to the manual rotation of the elevation handwheel, provided the TEST switch is set to TEST. When set to AID, the track antenna reflector assembly of the MTR system continues to move automatically in elevation after release of the elevation handwheel, provided the TEST switch is set to TEST. The rate and direction at which the track antenna reflector assembly moves remain the same as they were at the time the elevation handwheel was released. When set to AUTO, the track antenna reflector assembly of the MTR system is automatically positioned to the elevation angle of the object being tracked, provided the TEST switch is set to TEST.	
LAUNCHER ACQUIRE switch	S4	Toggle (two-position, springloaded to right)	When operated and held to right position, automatically slews the elevation, azimuth, and range circuits of the MTR system to the elevation, azimuth, and range of the designated missile or to missile flight simulator group.	
Range handwheel		Rotary	When rotated, the missile range, represented by the range circuits of the MTR system, increases or decreases, provided the range MAN—AID—AUTO switch is set to either MAN or AID, and the TEST switch is set to TEST.	3

Table 43 (U). Missile Track Control Drawer—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function	Key to fig. 57
Range MAN—AID—AUTO switch	S10	Rotary (three-position)	When set to MAN, the missile range, represented by the range circuits of the MTR system, increases or decreases at a rate directly proportional to the manual rotation of the range handwheel, provided the TEST switch is set to TEST. When set to AID, missile range, represented by the range circuits of the MTR system, increases or decreases automatically after release of the range handwheel, provided the TEST switch is set to TEST. When set to AUTO, the missile range, represented by the range circuits of the MTR system, automatically remains the same as the range of the object being tracked.	
Range SLEW switch	S3	Toggle (three-position, springloaded to center)	When operated, causes the range circuits of the MTR system to slew in or out in range at a more rapid rate than is provided by rotating the range handwheel.	
RANGE switch	S5	Toggle (three-position)	When set to ZERO, permits zeroing of the range circuits of the MTR system. When set to CALIBRATE, permits calibration of the range circuits of the MTR system. When set to NORMAL, permits normal operation of the range circuits of the MTR system.	
REJECT switch	S7	Pushbutton	When depressed, performs the functions listed in *a* and *b* below, provided no fire order has been issued. *a.* Extinguishes green READY and TRACK indicator lights and illuminates ivory READY and TRACK indicator lights on the missile control-indicator group. *b.* The ivory MISSILE READY and MISSILE TRACKED indicator lights on the battery signal panel-indicator illuminate.	
SERVOS switch	S11	Toggle (three-position)	When set to NORMAL, permits normal operation of the MTR system. When set to INC, applies a constant automatic tracking rate, in a positive direction, to the azimuth and elevation antenna positioning circuits of the MTR system for use during testing. When set to DEC, applies a constant automatic tracking rate, in a negative direction, to the azimuth and elevation antenna positioning circuits of the MTR system for use during testing.	
TEST switch	S1	Toggle (two-position with guard)	When set to TEST, places the MTR system in the test condition. When set to off (down) position, places the MTR system in automatic mode of operation.	
TRACKED switch	S6	Pushbutton	When depressed, performs the functions listed in *a* and *b* below, which indicate that the missile is being tracked in all three coordinates. *a.* Illuminates green TRACK indicator light and extinguishes ivory TRACK indicator light on the missile control-indicator group. *b.* The green MISSILE TRACKED indicator light on the battery signal panel-indicator illuminates.	

c. Missile Track Control Power Supply. The front panel controls and indicators of the missile track control power supply (7) are described in table 44.

Table 44 (U). Missile Track Control Power Supply—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
AGC switch	S7	Toggle (two-position)	When set to AGC, the AGC circuits automatically control the gain of the receiver system of the MTR system. When set to MANUAL, the gain of the receiver system of the MTR system is controlled by the GAIN knob, provided the TEST switch on the missile track control drawer is set to TEST.
FREQUENCY meter	M2		Indicates, on upper (SLEW) scale, the tuned cavity for which the MTR system magnetron is tuned. The upper scale is graduated from 5 to 1. Indicates, on lower (TUNE) scale, the existence of any difference between the resonant frequency of the tuned cavity and the operating frequency of the MTR system magnetron. The lower scale has a white section which is used for an on-frequency indication.
FREQUENCY switch	S6	Toggle (three-position, springloaded to center)	When operated to DECREASE, decreases the frequency of the magnetron of the MTR system to a minimum of 8,500 mc. When operated to INCREASE, increases the frequency of the magnetron of the MTR system to a maximum of 9,600 mc.
GAIN variable resistor	R7	Rotary (knob adjust)	When rotated, adjusts the gain of the receiver system of the MTR system, provided the AGC switch is set to MANUAL, and the TEST switch on the missile track control drawer is set to TEST.
HV SUPPLY variable transformer	T3	Rotary (knob adjust)	When rotated, adjusts high voltage applied to the transmitter system of the MTR system as indicated on the MAGNETRON meter. (Must be in START position, fully ccw, before high voltage can be applied to the transmitter system.)
HV SUPPLY—OFF switch	S2	Pushbutton	When depressed, removes high voltage from the transmitter system of the MTR system. Extinguishes HV SUPPLY—ON indicator light on the missile track control power supply and MISSILE—HIGH VOLTS—ON indicator light on the radar power control-indicator. Illuminates the HV SUPPLY—READY indicator light on the missile track control power supply and illuminates indicator lights on the radar power control-indicator listed in *a* through *d* below. *a.* MISSILE—HIGH VOLTS—READY *b.* MISSILE—HIGH VOLTS—HOT *c.* MISSILE—HIGH VOLTS—PREHEAT *d.* MISSILE—INTLK
HV SUPPLY—ON indicator light	I3	Red	When illuminated, indicates high voltage is applied to the transmitter system of the MTR system.
HV SUPPLY—ON switch	S4	Pushbutton	When depressed, applies high voltage to the transmitter system of the MTR system. Illuminates HV SUPPLY—ON indicator light on the missile track control power supply and MISSILE—HIGH VOLTS—ON indicator light on the radar power control-indicator. Extinguishes HV SUPPLY—READY indicator light on the missile track control power supply, and extinguishes the indicator lights on the radar power control-indicator listed in *a* through *d* below. *a.* MISSILE—HIGH VOLTS—READY *b.* MISSILE—HIGH VOLTS—HOT *c.* MISSILE—HIGH VOLTS—PREHEAT *d.* MISSILE—INTLK

Table 44 (U). Missile Track Control Power Supply—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
HV SUPPLY—READY indicator light	I2	Green	When illuminated, indicates high voltage may be applied to the transmitter system of the MTR system.
IND HV indicator light	I1	White	When illuminated, indicates high voltage is applied to the range indicator on the missile radar control console.
IND HV switch	S1	Toggle (two-position)	When set to the on (up) position, applies high voltage to the range indicator on the missile radar control console and illuminates IND HV indicator light.
MAGNETRON meter	M1		Indicates magnitude of average magnetron current, magnitude of high voltage applied to transmitter system, or magnitude of current of high voltage power supply of the MTR system as determined by the position of the MAGNETRON switch. The meter has two scales. The top scale is graduated from 0 to 20 in increments of 1, and the lower scale is graduated from 0 to 100 in increments of 5.
MAGNETRON switch	S5	Toggle (three-position, springloaded to center)	When operated to KV FS=20, the MAGNETRON meter indicates the magnitude of high voltage being applied to the magnetron of the transmitter system of the MTR system. The magnitude is indicated on the upper scale of the meter. The scale is graduated from 0 to 20, representing 0 to 20,000 volts in increments of 1, representing 1,000 volts.
			When released from either KV FS=20 or MA FS=100 to FS 20MA, the MAGNETRON meter indicates the average current of the magnetron of the transmitter system of the MTR system. Current is indicated in milliamperes on the top scale of the meter. Scale is graduated from 0 to 20 ma in increments of 1 ma.
			When operated to MA FS=100, the MAGNETRON meter indicates average current of the magnetron high voltage power supply of the MTR system. Current is indicated in milliamperes on the lower scale of the meter. Scale is graduated from 0 to 100 ma in increments of 5 ma.
OFF FREQ indicator light	I4	Light red	When illuminated, indicates that the MTR system magnetron is operating at an incorrect frequency.
TUNE—SLEW switch	S8	Rotary (two-position)	When set to the TUNE position, FREQUENCY meter indicates on the TUNE scale and allows FREQUENCY switch, when operated, to change the frequency of the MTR system magnetron at a tune (slow) rate.
			When set to the SLEW position, FREQUENCY meter indicates on the SLEW scale and allows FREQUENCY switch, when operated, to change the frequency of the MTR system magnetron at a slew (fast) rate.

d. Missile Control-Indicator Group. The front panel controls and indicators of the missile control-indicator group (12) are described in table 45.

Table 45 (U). Missile Control-Indicator Group—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
BURST indicator light	I11	Green	When illuminated, indicates the burst order has been issued.
BURST indicator light	I12	Ivory	When illuminated, indicates no burst order has been issued.

Table 45 (U). Missile Control-Indicator Group—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
DESIGNATE indicator light	I3	Green	When illuminated, indicates that either the launcher and section from which the missile is to be fired or the flight simulator group has been designated.
DESIGNATE indicator light	I4	Ivory	When illuminated, indicates that neither the launcher and section from which the missile is to be launched nor the flight simulator group has been designated.
FIRE indicator light	I7	Green	When illuminated, indicates the fire order has been issued.
FIRE indicator light	I8	Ivory	When illuminated, indicates the fire order has not been issued.
LAUNCH indicator light	I9	Green	When illuminated, indicates the computer has detected the launching of the missile.
LAUNCH indicator light	I10	Ivory	When illuminated, indicates no missile has been launched for the current engagement.
MISSILE—NIKE B indicator light	I20	Green	When illuminated, indicates a NIKE-HERCULES missile has been designated for the immediate engagement.
MISSILE—NIKE I indicator light	I19	Green	When illuminated, indicates a NIKE-AJAX missile has been designated for the immediate engagement.
RANGE—SLEW switch	S2	Toggle	When operated to the out (right) position, increases the simulated range of the RF signal produced by the missile oscillator in the radar test set. When operated to the in (left) position, decreases the simulated range of the RF signal produced by the missile oscillator in the radar test set.
RANGE—TRIM variable resistor	R2	Rotary (knob adjust)	When rotated, permits fine adjustment of the simulated range of the RF signal produced by the missile oscillator in the radar test set.
READY indicator light	I17	Green	When illuminated, indicates readiness of the designated missile or the flight simulator group.
READY indicator light	I18	Ivory	When illuminated, indicates that neither the designated missile nor the flight simulator group is ready to be tracked.
RECEIVED SIGNAL meter	M1		Indicates the magnitude of the MTR system receiver AGC voltage. Scale is graduated from 0 to 10 volts, representing 0 to 5 volts in increments of 0.5, representing 0.25 volt.
RECEIVER TEST indicator light	I2	Red	When illuminated, indicates the TARGET—STANDBY—MISSILE switch is set to MISSILE, and the radar test set is conditioned for testing the receiver system of the MTR system.
SIGNAL LEVEL dial			Indicates the attenuation of the transmitted signal from the missile oscillator of the radar test set. The dial is graduated from 0 to 35 db in increments of 1 db.
SIGNAL LEVEL synchro	B1	Rotary (knob adjust)	When rotated, adjusts the attenuation of the transmitted signal from the missile oscillator in the radar test set as indicated by the SIGNAL LEVEL dial.
TARGET—STANDBY—MISSILE switch	S1	Rotary (three-position)	When set to STANDBY, extinguishes RECEIVER TEST indicator light on the missile control-indicator group and RECEIVER TEST indicator light on the target test control. When set to MISSILE, conditions the radar test set for use in testing the MTR system. Illuminates RECEIVER TEST indicator light on the missile control-indicator group. When set to TARGET, conditions the radar test set for use in testing the TTR system. Illuminates RECEIVER TEST indicator light on the target test control.
TEST switch	S4	Toggle (two-position)	When set to I, selects the NIKE-AJAX coder circuits of the MTR system, provided the TEST switch on the missile track control drawer is set to TEST. Illuminates the MISSILE—NIKE I indicator light.

Table 45 (U). Missile Control-Indicator Group—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
TEST switch—Continued			When set to B, selects the NIKE–HERCULES coder circuits of the MTR system, provided TEST switch is set to TEST. Illuminates the MISSILE—NIKE B indicator light.
TRACK indicator light	I5	Green	When illuminated, indicates the designated missile or flight simulator is being tracked by the MTR system.
TRACK indicator light	I6	Ivory	When illuminated, indicates neither a missile nor the flight simulator group is being tracked by the MTR system.

e. Range Indicator. The controls and indicators of the range indicator (10) are described in table 46.

Table 46 (C). Range Indicator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
FOCUS variable resistor	R6	Rotary (knob adjust)	When rotated, adjusts the clearness and sharpness of the indicator presentation.
IMAGE SPACING switch	S1	Rotary (three-position)	When set to either OFF or NOR, a single trace extends across the face of the range indicator. When set to SEL SIG, the presentation of the range indicator appears the same as when the switch is set to OFF or NOR, except the trace on either side of the 500-yard expanded sweep is not visible.
INTENSITY variable resistor	R4	Rotary (knob adjust)	When rotated, adjusts the brilliance of the indicator presentation.
Range dial			Indicates the missile range represented by the range circuits of the MTR system. The dial is graduated from 0 to 200,000 yards in increments of 10 yards.
Range indicator	V1	Cathode-ray tube	Displays range video presentation of 200,000 yards when TEST switch on missile control-indicator group is set to B, and 55,000 yards when TEST switch is set to I.
SWEEP LENGTH variable resistor	R3	Rotary (knob adjust)	When rotated, varies the range represented by the sweep on the indicator presentation from a minimum of 40,000 yards to a maximum of 200,000 yards for NIKE–HERCULES operation, and a minimum of 10,000 yards to a maximum of 55,000 yards for NIKE–AJAX operation.

Section III (U). FRONT PANEL CONTROLS AND INDICATORS FOR THE LOPAR, MISSILE TRACK, TARGET TRACK, AND TARGET RANGE ANTENNA–RECEIVER–TRANSMITTER GROUPS AND RADAR TEST SET

91 (U). LOPAR Antenna-Receiver-Transmitter Group and Missile Track, Target Track, and Target Range Antenna-Receiver-Transmitter Groups

a. LOPAR Antenna-Receiver-Transmitter Group. The controls of the LOPAR antenna-receiver-transmitter group (fig. 36) are on the acquisition antenna pedestal (fig. 39) and the SIF/IFF receiver-transmitter (fig. 41), coder control, and recognition signal simulator. These controls are described in (1) and (2) below.

(1) *Acquisition antenna pedestal.* The control on the acquisition antenna pedestal (fig. 39) is described in table 47. The nonplacarded control is shown on figure 58.

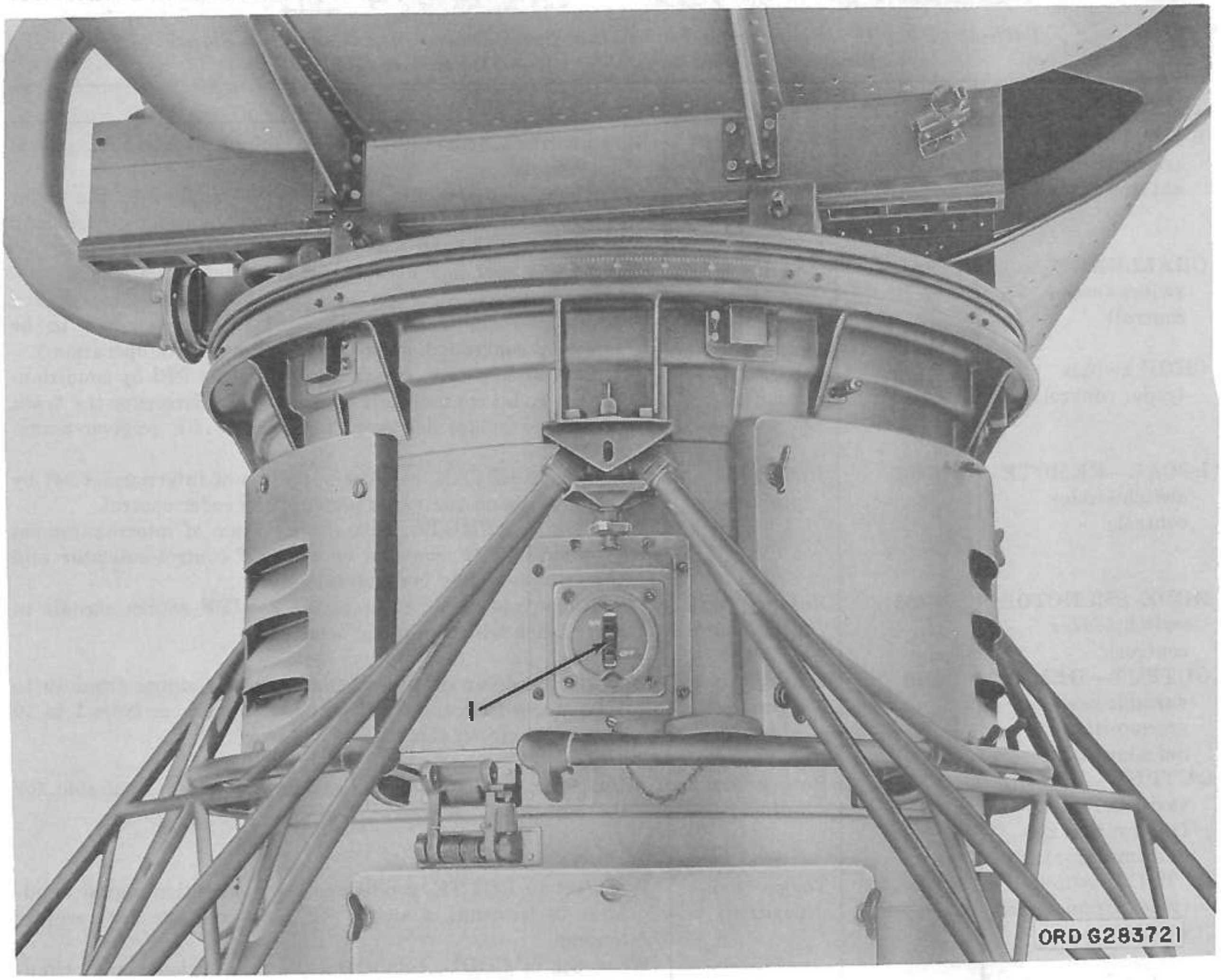


Figure 58 (U). LOPAR antenna-receiver-transmitter group—acquisition antenna pedestal—nonplacarded control (U).

Table 47 (U). LOPAR Antenna-Receiver-Transmitter Group—Acquisition Antenna Pedestal—Front Panel Control (U)

Control or indicator	Appar des	Type	Function	Key to fig. 58
Antenna disable switch	S1	Toggle (three-position)	When set to OFF, disables the antenna azimuth drive motors and high voltage circuits in the LOPAR antenna-receiver-transmitter group. When set to ON, enables the antenna azimuth drive motors, and permits the high voltage circuits of the LOPAR antenna-receiver-transmitter group to be energized. When set to center, disables the antenna azimuth drive motors, and permits the high voltage circuits of the LOPAR antenna-receiver-transmitter group to be energized.	1

(2) *SIF/IFF receiver-transmitter, coder controls, and recognition signal simulator.* The front panel controls on the SIF/IFF receiver-transmitter, coder control, and recognition signal simulator (fig. 41) are described in table 48.

Table 48 (U). SIF/IFF Receiver-Transmitter, Coder Control, and Recognition Signal Simulator—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
B+ ON switch (recognition signal simulator)	S4	Toggle (two-position)	When set to LOCAL, B+ power is applied only during local operation. When set to REMOTE, B+ power is applied to the coder control when the CHOP switches on the coder control and IFF control-indicator are set to ON.
CHALLENGE switch (coder control)	S404	Toggle (two-position)	When set to ON, initiates operation of interrogator set. When set to OFF, stops operation of interrogator set or allows the challenge function of interrogator set to be remotely controlled. (Set to OFF for remote operation.)
CHOP switch (coder control)	S405	Toggle (two-position)	Produces broken IFF return signals on the PPI by conditioning the coder control unit to periodically interrupt the train of trigger pulses delivered to the SIF/IFF receiver-transmitter.
LOCAL—REMOTE switch (coder control)	S402	Rotary (two-position)	When set to LOCAL, permits operation of interrogator set by the controls on the front panel of the coder control. When set to REMOTE, permits operation of interrogator set by the SIF/IFF controls on the IFF control-indicator and the IFF auxiliary control-indicator.
MODE SELECTOR switch (coder control)	S403	Rotary (three-position)	Conditions interrogator set to receive IFF return signals in accordance with the mode selected.
OUTPUT—DELAY variable resistor (recognition signal simulator)	R16	Rotary (knob adjust)	Adjusts the delay of the simulator output signal from 10 to 100 μsec, with respect to the input triggers, or from 1 to 10 mils in range on the PPI.
OUTPUT—LEVEL variable resistor (recognition signal simulator)	R34	Rotary (knob adjust)	Adjusts the R output signal strength to a level suitable for the associated receiver.
OUTPUT switch (recognition signal simulator)	S3	Toggle (two-position)	When set to PULSE, conditions the recognition signal simulator to transmit a single RF pulse suitable for receiver testing. When set to CODE, conditions the recognition signal simulator to transmit a code 77 RF signal to the receiver and video decoder for testing.
POWER indicator light (coder control)	E416	Red	When illuminated, indicates that ac power is applied to the receiver-transmitter.
POWER indicator light (receiver-transmitter)	E120	Red	When illuminated, indicates that dc power is applied to the SIF/IFF receiver-transmitter.
POWER switch (coder control)	S407	Toggle (two-position)	When set to ON, applies ac power to the SIF/IFF receiver-transmitter.
POWER switch (receiver-transmitter)	S104	Toggle (two-position)	When set to ON, applies ac power to the SIF/IFF receiver-transmitter.
POWER switch (recognition signal simulator)	S2	Toggle (two-position)	When set to ON, applies 110-volt, 400-cycle, ac power to the recognition signal simulator.
TRIG IN 2 switch (recognition signal simulator)	S1	Toggle (two-position)	When set to MODE 2, conditions the recognition signal simulator to be triggered by the mode 2 output only from the coder control unit. When set to PULSE, conditions the simulator for operation from any trigger pulse available.

b. Missile Track, Target Track, and Target Range Antenna-Receiver-Transmitter Groups. The controls and indicators on the missile track, target track, and target range antenna-receiver-transmitter groups (fig. 44) are similar. The controls and indicators are on the track antenna pedestal, track antenna level, local antenna control, antenna test set, range antenna support base, and azimuth drive equipment enclosure and are described in (1) through (8) below.

(1) The controls on the track antenna pedestal (6, fig. 44) are described in table 49. The nonplacarded controls are shown on figure 45.

Table 49 (U). Missile Track, Target Track, or Target Range Antenna-Receiver-Transmitter Group Conrtols (U)

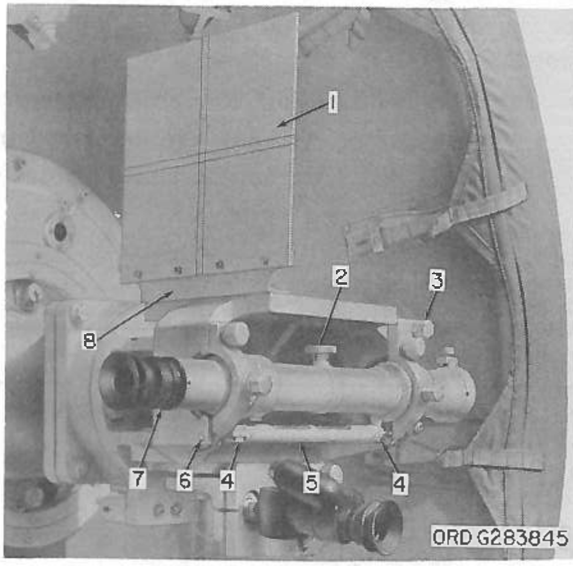
Control or indicator	Appar des	Type	Function	Fig.
Slide (azimuth antirotational lock)		Mechanical	Permits the antenna pedestal support to be mechanically locked to prevent movement in azimuth.	2, fig. 45
BLOWER switch	S7	Toggle (two-position)	When set to ON, energizes the blower which inflates the radome. When set to OFF, disables elevation and azimuth drive motor to prevent rotation of antenna.	
Elevation lock		Mechanical	Permits the track antenna reflector assembly and the range antenna reflector to be mechanically locked to prevent movement in elevation.	5, fig. 45

(2) The controls and indicators of the track antenna level are described in table 50.

Table 50 (U). Track Antenna Level—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
ILLUMINATION switch	S1	Toggle (two-position, springloaded)	Illuminates level light.
ILLUMINATION switch	S2	Toggle (two-position, springloaded)	Illuminates level light.
Level knob		Rotary	Adjusts left level.
Level knob		Rotary	Adjusts right level.

(3) The controls for the sighting and viewing telescopes are shown in figures 59 through 61 and are listed in the associated legends.



1—Reticle level target
2—Focus knob
3—Reticle level adjustment screw
4—Spirit level adjustment screw
5—Spirit level
6—V-block
7—Eyepiece
8—Mounting bracket

Figure 59 (U). Sighting telescope and mount (U).

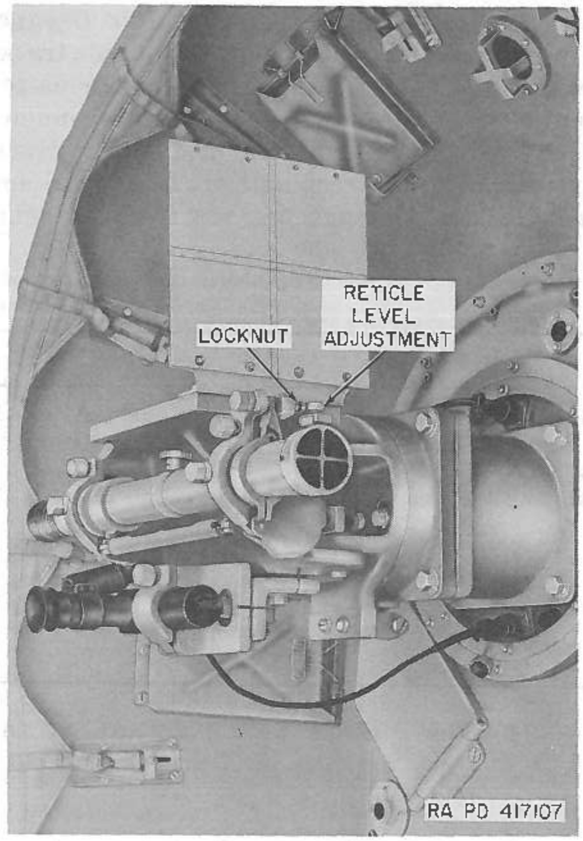


Figure 60 (U). Reticle level adjustment and locknut (U).

1—Collimating target
2—Sighting telescope
3—Sighting telescope azimuth adjustment screw
4—Sighting telescope elevation locking screw
5—Threshold light
6—Guidance cutoff (GCO) adjustment screw
7—Sighting telescope elevation adjustment screw
8—Locking nuts
9—GCO locking screw
10—Sighting telescope azimuth locking screw (2)
11—Viewing telescope azimuth locking screw (2)
12—Viewing telescope elevation locking screw (2)
13—Viewing telescope

Figure 61 (U). Telescope installed—legend (U).

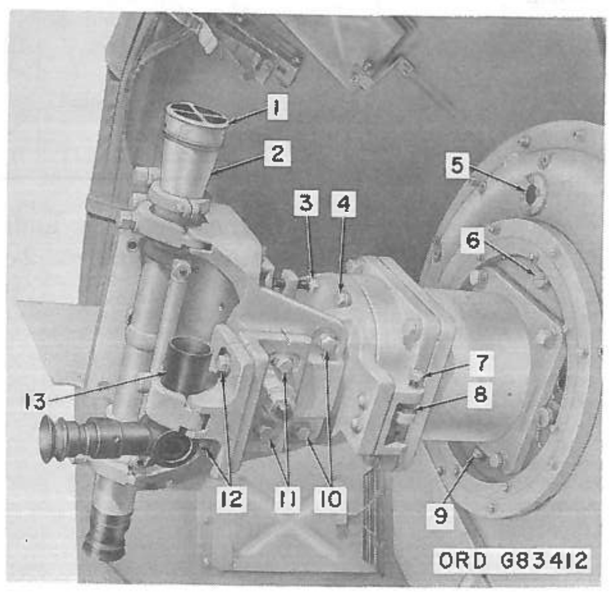


Figure 61 (U). Telescope installed (U).

(4) The azimuth adjusting screw and securing bolt, used for adjusting the track antenna-receiver-transmitters in azimuth, are shown on figure 62.

(5) The azimuth and elevation tilt adjustment screws are shown on figure 63.

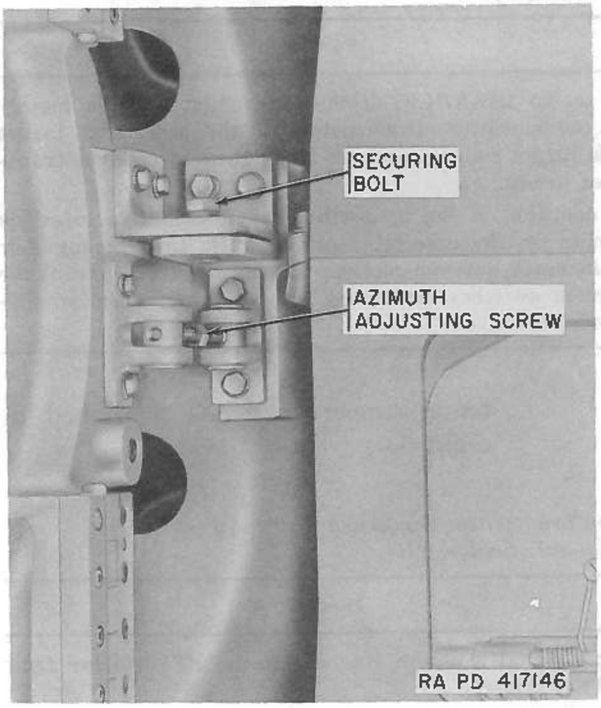


Figure 62 (U). Azimuth adjusting screw and securing bolt (U).

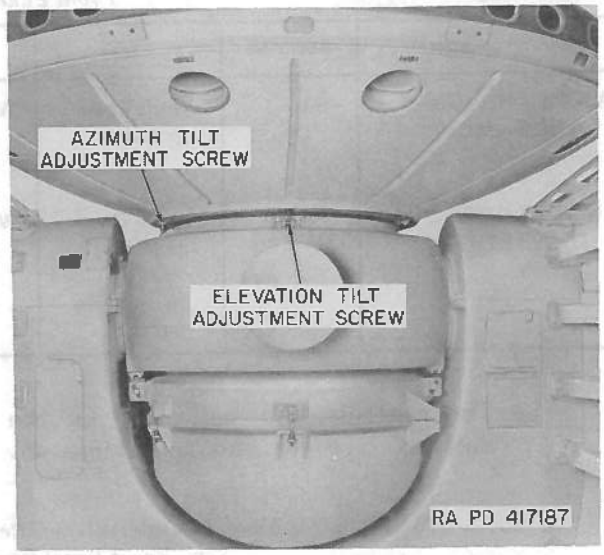


Figure 63 (U). Tilt adjustment screws (U).

(6) The controls on the local antenna control used with the MTR and TTR are described in table 51.

Table 51 (U). Local Antenna Control—Front Panel Controls (U)

Control or indicator	Appar des	Type	Function
Azimuth INCREASE—DECREASE switch	S1	Toggle (three-position, springloaded to center)	When operated to INCREASE, slews the antenna ccw in azimuth. When operated to DECREASE, slews the antenna cw in azimuth. When released from either INCREASE or DECREASE to center position, antenna remains at the same position as it was at time the switch was released.
AZIMUTH synchro	B1	Rotary (dual control knob adjust)	When rotated, positions the antenna to the right or left in azimuth (fine and coarse).
Elevation INCREASE—DECREASE switch	S2	Toggle (three-position, springloaded to center)	When operated to INCREASE, positions antenna up in elevation. When operated to DECREASE, positions antenna down in elevation. When released from INCREASE or DECREASE to center position, antenna remains at the same position as it was at the time the switch was released.
ELEVATION synchro	B2	Rotary (dual control knob adjust)	When rotated, positions the antenna up or down in elevation (fine and coarse).

(7) The controls on the missile track or target track azimuth drive equipment enclosure are described in table 52.

Table 52 (U). Missile Track or Target Track Azimuth Drive Equipment Enclosure—Front Panel Controls (U)

Control or indicator	Appar des	Type	Function
ANTENNA DISABLE switch	S1	Toggle (two-position)	When set to DISABLE, disables the azimuth drive motors and the elevation drive motors of the associated target track, target range, or missile track antenna-receiver-transmitter group.
INTERLOCK OVERRIDE switch	S8	Toggle (two-position, springloaded to up, with cover)	When operated to the up position, all low voltage interlock switches on the associated target track, target range, or missile track antenna-receiver-transmitter group except the interlock switches associated with the magnetron are bypassed.

(8) The controls and indicators on the antenna test set and the range antenna support base are described in table 53.

Table 53 (U). Target Range Antenna-Receiver-Transmitter Group and Antenna Test Set—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
ANTENNA BEAM POSITION meter	M1		Indicates signal strength received at the RF detector from the TRR system.
ANTENNA disable switch	S1	Toggle (two-position)	When set to DISABLE, disables antenna servos. When set to NORMAL, enables antenna servos.
AZ—CCW switch	S2	Pushbutton	When depressed, slews range antenna reflector ccw in azimuth.
AZ—CW switch	S1	Pushbutton	When depressed, slews range antenna reflector cw in azimuth.
AZIMUTH synchro	B1	Rotary (knob adjust)	When rotated, positions the range antenna reflector in azimuth (fine and coarse adjustment).
CONTROL switch	S5	Toggle (two-position)	When set to RCT, range antenna reflector positioning is controlled by TTR. When set to ANT, range antenna reflector positioning is controlled locally.
EL—DOWN switch	S4	Pushbutton	When depressed, slews range antenna reflector down in elevation.
ELEVATION synchro	B2	Rotary (knob adjust)	When rotated, positions the range antenna reflector in elevation (fine and coarse adjustment).
EL—UP switch	S3	Pushbutton	When depressed, slews range antenna reflector up in elevation.
GAIN variable resistor	R1	Rotary (knob adjust)	When rotated, adjusts the gain of the RF detector.
INTERLOCK OVERRIDE switch	S8	Toggle (two-position)	When operated to the up position, all low voltage interlock switches, except the interlock switches associated with the magnetron, are bypassed.
RF TEST SET switch	S4	Toggle (two-position)	When set to ON, supplies line power to the RF detector on radar test set. When set to OFF, removes line power from the RF detector on radar test set.

92 (U). Radar Test Set

The controls and indicators of the radar test set are on the target oscillator, test set monitor panel, RF power meter, and missile oscillator. These controls and indicators are described in table 54.

Table 54 (U). Radar Test Set—Front Panel Controls and Indicators (U)

Control or indicator	Appar des	Type	Function
AC POWER switch	S1	Toggle (two-position)	When set to ON, energizes radar test set for checking power and for alining the MTR or TTR system.
CAL 0 variable resistor	R23	Rotary (knob adjust)	When rotated, permits a zero reference to be established on the RF POWER-DB meter, provided the S/N ATTEN-DB dial indicates 0 db, and the PWR METER CAL switch is set to CAL 0.
CAL ∞ variable resistor	R7	Rotary (knob adjust)	When rotated, permits an infinity (∞) reference to be established on the RF POWER-DB meter, provided the S/N ATTEN-DB dial indicates 0 db, and the PWR METER CAL switch is set to CAL ∞.
CAL V variable resistor	R48	Rotary (knob adjust)	When rotated, permits a voltage reference to be established on the RF POWER-DB meter, provided the S/N ATTEN-DB dial indicates 0 db, and the PWR METER CAL switch is set to ADJ V.
LAMPS switch	S5	Pushbutton	When depressed, illuminates the dial lights on the RF POWER-DB meter, S/N ATTEN-DB dial and MEAS FREQ counter. When depressed a second time, extinguishes these same three dial lights.
MEAS FREQ calibration chart			Serves as a conversion chart used for converting indications appearing on the MEAS FREQ counter into megacycles or for converting megacycles into indications appearing on the MEAS FREQ counter.
MEAS FREQ counter			Indicates the number of counter units that correspond to the setting of the MEAS FREQ knob.
MEAS FREQ knob		Rotary	When rotated, the pointer of the RF POWER-DB meter moves toward ∞. At maximum deflection of the pointer, the value indicated by the MEAS FREQ counter can be converted into the frequency at which either the target oscillator or missile oscillator is operating.
MISSILE OSCILLATOR—FREQUENCY variable resistor	R5	Rotary (knob adjust)	When rotated, permits coarse adjustments of the frequency of the missile oscillator.
MISSILE OSCILLATOR—OUTPUT attenuator	AT1	Rotary (knob adjust)	When rotated, adjusts the output of the missile oscillator.
MISSILE OSCILLATOR—REPELLER variable resistor	R6	Rotary (knob adjust)	When rotated, permits fine adjustment of the frequency of the missile oscillator.
PWR METER CAL switch	S3	Rotary (four-position)	When set to ADJ V, permits calibration of RF POWER-DB meter by the CAL V knob. When set to ADJ ∞, permits calibration of the RF POWER-DB meter by the CAL ∞ knob. When set to ADJ 0, permits calibration of the RF POWER-DB meter by the CAL 0 knob. When set to MEAS, the RF POWER-DB meter may be used for measuring the output power of the target oscillator or missile oscillator or the power received from the MTR or TTR system.

Table 54 (U). Radar Test Set—Front Panel Controls and Indicators—Continued *(U)*

Control or indicator	Appar des	Type	Function
RF POWER-DB meter	M1		Indicates either the output power of the target oscillator or missile oscillator of the radar test set or the power received from the MTR or TTR system. Meter is graduated from ∞ to 0 db.
S/N ATTEN-DB dial			Indicates the attenuation of the signal transmitted by the radar test set. Dial is graduated from 0 to 35 db in increments of 1 db. Positioned automatically by SIGNAL LEVEL knob on the target test control or the missile control-indicator group in REMOTE, TRANS, and PULSE positions of TEST switch.
S/N ATTEN-DB attenuator	AT4	Rotary (knob adjust)	When rotated, adjusts the attenuation of the signal transmitted by the radar test set as indicated on the S/N ATTEN-DB dial.
TARGET OSCILLATOR—FREQUENCY variable resistor	R5	Rotary (knob adjust)	When rotated, permits coarse adjustment of the frequency of the target oscillator.
TARGET OSCILLATOR—OUTPUT attenuator	AT1	Rotary (knob adjust)	When rotated, adjusts the output of the target oscillator.
TARGET OSCILLATOR—REPELLLER variable resistor	R6	Rotary (knob adjust)	When rotated, permits fine adjustment of the frequency of the target oscillator.
TEST switch	S2	Rotary (five-position)	When set, determines the type of operation to be performed by the radar test set.
TRANS PWR DB switch	S4	Rotary (ten-position)	When set, the value corresponding to the switch setting, plus the indication on RF POWER-DB meter, equals the db value of the signal being monitored.

CHAPTER 6 (C)

BEHIND PANEL CONTROLS AND INDICATORS FOR THE RADAR COURSE DIRECTING CENTRAL

Section I (C). TRAILER MOUNTED DIRECTOR STATION

93 (U). Director Station Group

The controls and indicators of the director station group (16, fig. 16) are located on the director station cabinet, acquisition power control panel, +250 or +150 volt regulator, +270v, −28v, and +75v or +175v power supply, 4-kc oscillator, 20-30 second delay timer, acquisition interference suppressor, fast AGC amplifier, video and mark mixer, acquisition-track synchronizer, electronic gate, MTI oscilloscope, MTI video amplifier, trigger pulse-video amplifier, delay line driver, and ±320v or +220v power supply. These controls and indicators are described in alphabetical order in table 55. All nonplacarded controls and indicators are shown on the referenced figures.

Table 55 (U). Director Station Group—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
4-kc oscillator	ACQ ADJ variable resistor	R5	Rotary with lock (screwdriver adjust)	Adjusts the amplitude of the CARRIER ACQ 4-KC signal.	
	LINE ADJ variable resistor	R18	Rotary with lock (screwdriver adjust)	Adjusts the amplitude of the LINE 4-KC signal.	
20-30 second delay timer	Delay time variable resistor	R11	Rotary with lock (screwdriver adjust)	Varies timer interval.	
+250 or +150 volt regulator	2AMPS—+150V fuse indicator	I1	Red	When alluminated, indicates associated fuse F1 has blown.	
	BALANCE variable resistor	R21	Rotary with lock (screwdriver adjust)	Adjusts output of the regulator.	
+270v, −28v, and +75v or +175v power supply	10A—−28v fuse indicator	I1	Red	When illuminated, indicates associated fuse F1 has blown.	1, fig. 64
±320v or +220v power supply	V ADJ SEC 1 (+) variable resistor	R22	Rotary with lock (screwdriver adjust)	Adjusts voltage output.	
	V ADJ SEC 2 (− OR +) variable resistor	R42	Rotary with lock (screwdriver adjust)	Adjusts voltage output.	
Acquisition interference suppressor	Delay bias adjust variable resistor	R8	Rotary with lock (screwdriver adjust)	Adjusts bias level in delay video channel.	2, fig. 65
	Delay-processor adjust variable resistor	R35	Rotary with lock (screwdriver adjust)	Adjusts gain of delay video channel when in processor mode of operation.	4, fig. 65
	Nondelay processor adjust variable resistor	R37	Rotary with lock (screwdriver adjust)	Adjusts gain of nondelay video channel when in processor mode of operation.	3, fig. 65

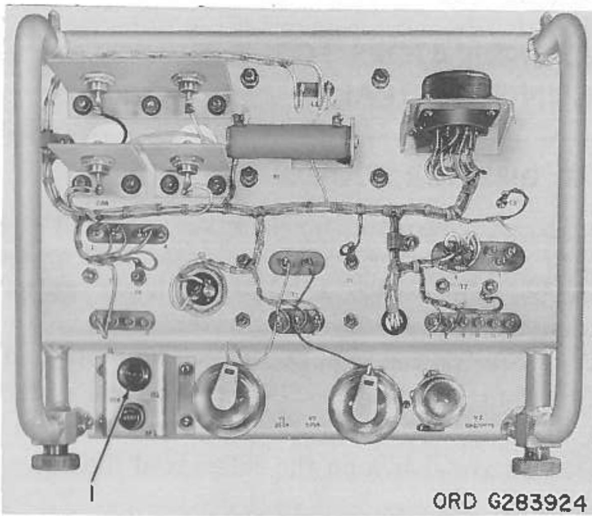


Figure 64 (U). +270v, —28v, and +75v or +175v power supply—nonplacarded controls (U).

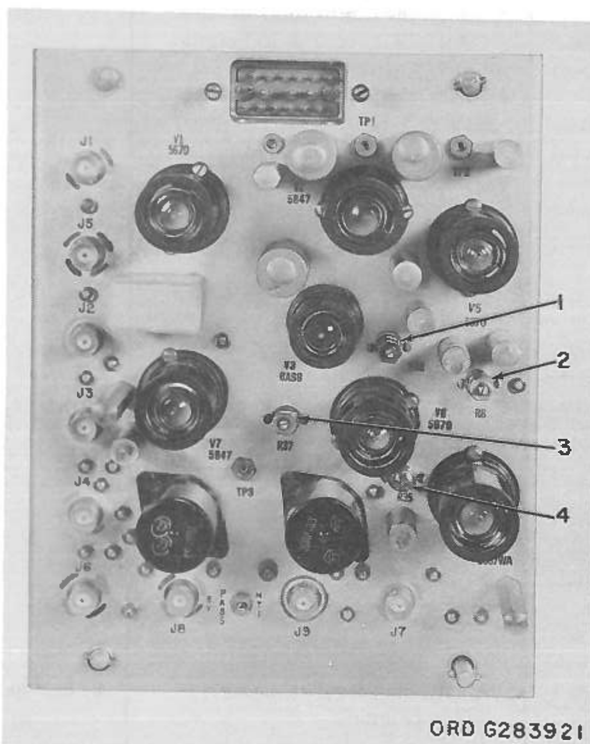


Figure 65 (U). Acquisition interference suppressor—nonplacarded controls (U).

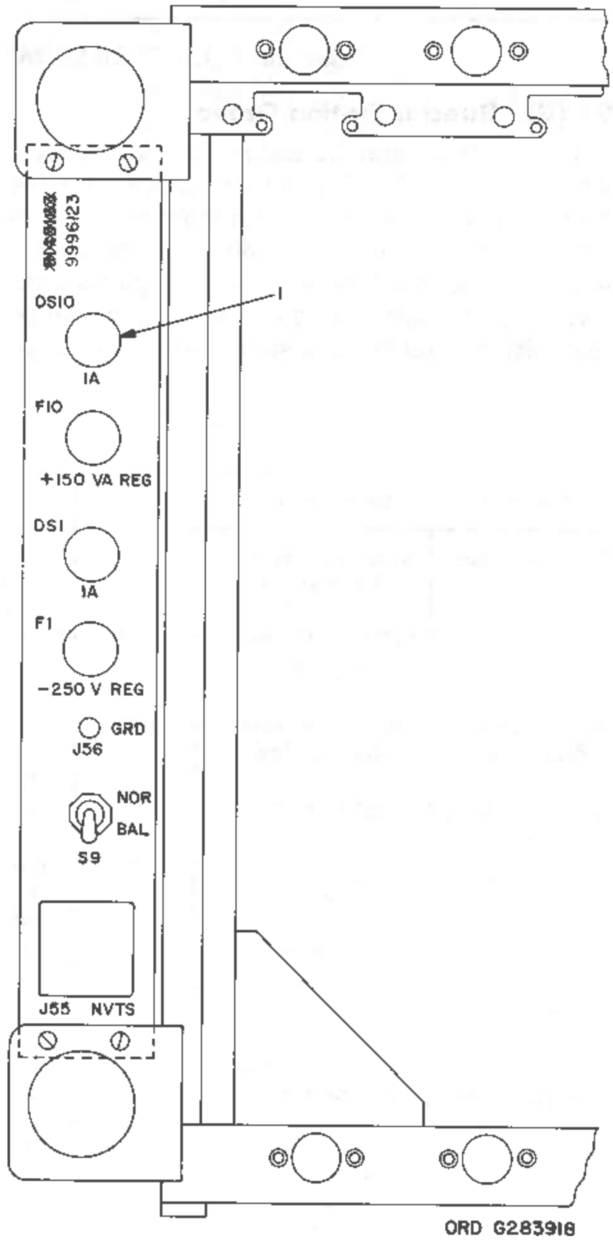


Figure 66 (U). Director station group—nonplacarded indicators (U).

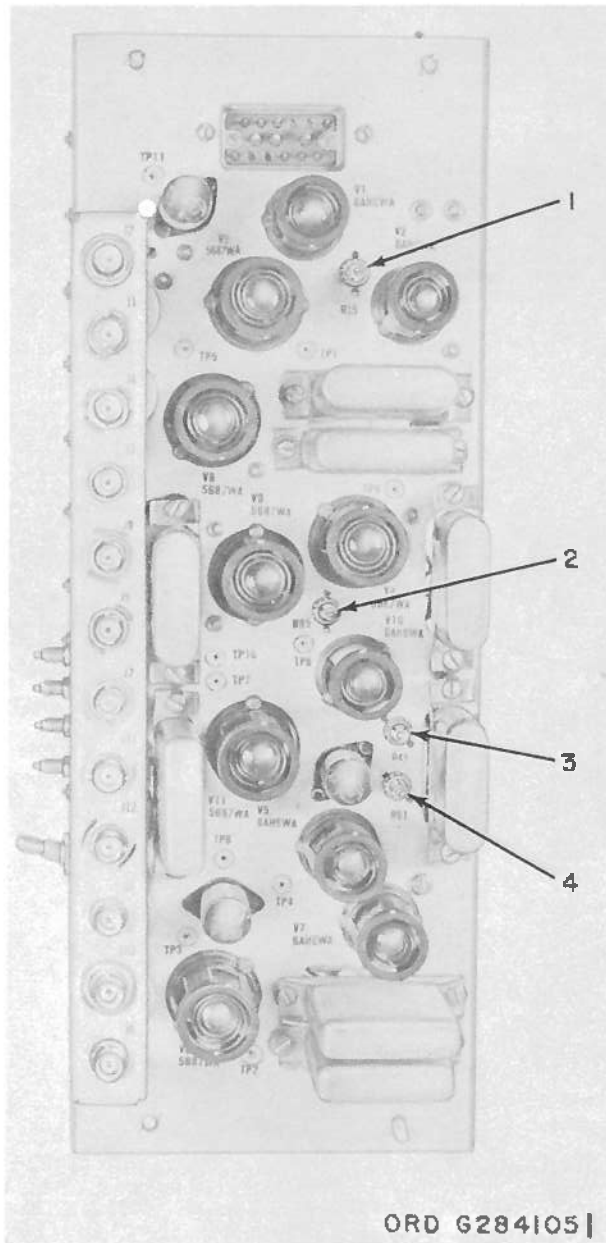


Figure 66.1 (U). Video and mark mixer—nonplacarded controls and indicators (U).

Table 55 (U). Director Station Group—Behind Panel Controls and Indicators—Continued (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Acquisition interference suppressor—Continued	Nondelay variable resistor	R48	Rotary with lock (screw-driver adjust)	Adjusts bias level in nondelay video channel.	1, fig. 65
	BY PASS—MTI switch	S1	Toggle (three-position)	Permits monitoring either the bypass video or the MTI video at test output J8.	
Acquisition power control panel	EQPT VENT switch	S7	Toggle (two-position)	Energizes the equipment cooling system in the trailer mounted director station.	
	VOLTS ADJ switch	S11	Toggle (two-position)	Transfers phase C adjustment from acquisition power control panel to the radar power control-indicator.	
Acquisition-track synchronizer	FREQ HIPAR variable resistor	R50	Rotary with lock (screw-driver adjust)	Used only when installed in the tracking station trailer.	
	FREQ LOPAR variable resistor	R6	Rotary with lock (screw-driver adjust)	Varies the pulse repetition rate when in LOPAR operation.	
	SYNC DELAY LONG PULSE variable resistor	R21	Rotary with lock (screw-driver adjust)	Adjusts delay of sync pulse from preknock.	
	SYNC DELAY SHORT PULSE variable resistor	R52	Rotary with lock (screw-driver adjust)	Not used.	
	TEST switch	S1	Rotary (three-position)	Switches between free running slaved synchronizer.	
Delay line driver	CHANN 1 CARR LEVEL ADJ variable resistor	R19	Rotary with lock (screw-driver adjust)	Adjusts carrier level in nondelay video channel.	
	CHANN 2 CARR LEVEL ADJ variable resistor	R25	Rotary with lock (screw-driver adjust)	Adjusts carrier level in processor feed-back channel.	
	MOD ADJ variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts modulated MTI video level.	
	Variable capacitor	C16	Variable	Varies carrier frequency.	10, fig. 141
Director station cabinet	—250V REG fuse indicator	I1	Red	When illuminated, indicates associated fuse F1 has blown.	
	+220v fuse indicator	DS10	Red	When illuminated, indicates associated fuse F1 has blown.	1, fig. 66
	NOR—BAL switch	S9	Toggle (two-position)	Connects the —250 volts to the null voltage test set.	
	Test pulse adjust variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts amplitude of MTI test pulse.	8, fig. 141
Electronic gate	4 KC ADJ variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts 4-kc signal input.	
	360° RANGE variable resistor	R26	Rotary with lock (screw-driver adjust)	Adjusts MTI range in 360° operation.	
	JS GAIN variable resistor	R53	Rotary with lock (screw-driver adjust)	Adjusts level of jam strobe video.	

Table 55 (U). Director Station Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Electronic gate—Continued	SECTOR RANGE variable resistor	R25	Rotary with lock (screw-driver adjust)	Adjusts MTI range in sector operation.	
	SECTOR WIDTH variable resistor	R8	Rotary with lock (screw-driver adjust)	Sets the width of the MTI sector.	
	SW BAL variable resistor	R45	Rotary with lock (screw-driver adjust)	Eliminates step at end of MTI range.	
Fast AGC amplifier	AGC ADJ variable resistor	R25	Rotary with lock (screw-driver adjust)	Adjusts operating bias when in AGC mode of operation.	
	BY PASS VID GAIN variable resistor	R10	Rotary with lock (screw-driver adjust)	Adjusts amplitude of bypass video.	
	GATE LENGTH variable resistor	R57	Rotary with lock (screw-driver adjust)	Adjusts the time duration of the AGC gate.	
	IF GAIN ADJ variable resistor	R48	Rotary with lock (screw-driver adjust)	Adjusts for operating bias when not in AGC mode.	
MTI oscilloscope	CARRIER LEVEL meter	M1		Monitors MTI adjustments.	
	Cathode-ray tube	V5	CRT	Visually presents circuits monitored with MTI CKT TEST switch.	
	FOCUS variable resistor	R35	Rotary (knob adjust)	Focuses electron beam for a sharp sweep.	
	GAIN variable resistor	R18	Rotary (knob adjust)	Adjusts amplitude of presentation on MTI oscilloscope.	
	HOR POS variable resistor	R16	Rotary with lock (screw-driver adjust)	Positions MTI oscilloscope sweep horizontally.	
	INTENSITY variable resistor	R28	Rotary with lock (screw-driver adjust)	Controls sweep brightness.	
	MTI CKT TEST switch	S1	Rotary (11-position)	Selects desired input to MTI oscilloscope.	
	VERT POS variable resistor	R31	Rotary (knob adjust)	Positions MTI oscilloscope sweep vertically.	
MTI video amplifier	MTI VIDEO variable resistor	R10	Rotary with lock (screw-driver adjust)	Adjusts amplitude of MTI video.	
Trigger pulse-video amplifier	MTI delay network	Z2	Variable (with lock)	Varies time delay in delay channel.	9, fig. 141
Video and mark mixer	ACQ RG MARK variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts amplitude of acquisition range mark.	
	ACQ MARKS switch	S3	Toggle (two-position)	When set to ON (up) position, connects the acquisition range mark into the IFF video circuit for normal operation. When set to the down position, disconnects the acquisition range mark from the IFF video circuit so that IFF video may be monitored at TP11.	

Table 55 (U). Director Station Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Video and mark mixer—Continued	ATBM switch	S1	Toggle (two-position)	When set to up position, provides required video circuit connections for NIKE–HERCULES and Improved NIKE–HERCULES Systems. When set to the ATBM (down) position provides required video circuit connections for ATBM systems.	
	HIPAR/AAR VIDEO variable resistor	R71	Rotary with lock (screwdriver adjust)	Adjusts amplitude of HIPAR/AAR video.	
	IFF VIDEO variable resistor	R69	Rotary with lock (screwdriver adjust)	Adjusts amplitude of IFF video.	
	MARKS switch	S1	Toggle (two-position)	Allows marks and symbols to be applied to all acquisition indicators for test purposes.	
	Variable resistor	R15	Rotary with lock (screwdriver adjust)	Adjusts amplitude of marks and IFF video.	1, fig. 66.1
	Variable resistor	R43	Rotary with lock (screwdriver adjust)	Adjusts amplitude of HIPAR or AAR video and marks.	3, fig. 66.1
	Variable resistor	R61	Rotary with lock (screwdriver adjust)	Adjusts amplitude of HIPAR/AAR or LOPAR video.	4, fig. 66.1
	Variable resistor	R85	Rotary with lock (screwdriver adjust)	Adjusts amplitude of LOPAR video.	2, fig. 66.1
	WIDTH variable resistor	R25	Rotary with lock (screwdriver adjust)	Varies width of the arc on the electronic cross.	

94 (U). Recorder Group

The controls and indicators for the recorder group (14, fig. 16) are located on the meter and channel control-indicator, data switching panel, multichannel data recorder, and signal and channel relay assembly. Nonplacarded controls and indicators of the recorder group are shown on figure 67, and all controls and indicators are described in alphabetical order in table 56.

94.1 (U). Altitude Plotting Board

The HIPAR ZERO ADJUST knob is used to move the rotor on resolver B1 on the differential resolver assembly which is mounted behind the altitude plotting board. This resolver is used for orienting the HIPAR or AAR system to the LOPAR.

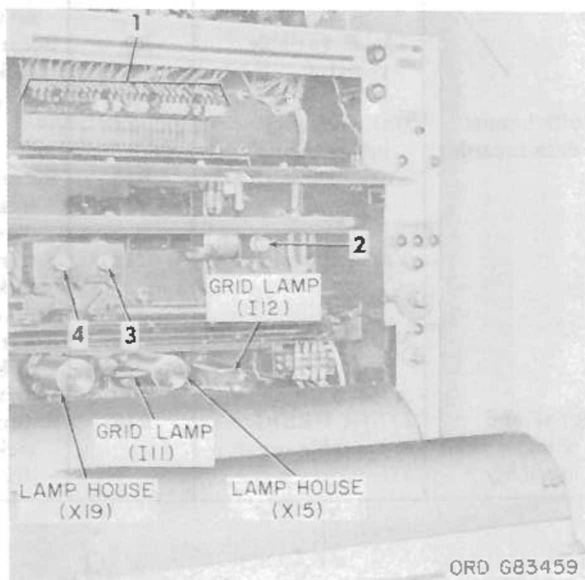


Figure 67 (U). Multichannel data recorder—nonplacarded behind panel controls and indicators (U).

Table 56 (U). Recorder Group—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Data switching panel	TEST indicator light	I1	White	When illuminated, the period of illumination indicates the time shared test circuit cycle.	
	TEST switch	S1	Pushbutton	When depressed, connects a time shared test circuit.	
Meter and channel control-indicator	CALIBRATE—OPERATE—ZERO switch	S1	Toggle (three-position)	When set to CALIBRATE, connects the galvanometer calibration circuits. When set to OPERATE, leaves normal operation circuits unaffected. When set to ZERO, connects the galvanometer zero circuits.	
	G_P variable resistor	R6	Rotary with lock (screw-driver adjust)	Used to calibrate the G_P galvanometer.	
	G_T variable resistor	R8	Rotary with lock (screw-driver adjust)	Used to calibrate the G_T galvanometer.	
	MSL SPEED variable resistor	R4	Rotary with lock (screw-driver adjust)	Used to calibrate the MSL SPEED galvanometer.	
	NO MSL PREP variable resistor	R1	Rotary with lock (screw-driver adjust)	Used to calibrate the NO MSL PREP galvanometer.	
	TGT VEL H variable resistor	R2	Rotary with lock (screw-driver adjust)	Used to calibrate the TGT VEL H galvanometer.	
	TGT VEL X variable resistor	R5	Rotary with lock (screw-driver adjust)	Used to calibrate the TGT VEL X galvanometer.	
	TGT VEL Y variable resistor	R3	Rotary with lock (screw-driver adjust)	Used to calibrate the TGT VEL Y galvanometer.	
	TIME variable resistor	R9	Rotary with lock (screw-driver adjust)	Used to calibrate the TIME galvanometer.	
Multichannel data recorder	Galvanometer adjustments			Used to zero the galvanometer traces.	1, fig. 67
	Variable resistor	R13	Rotary with lock (screw-driver adjust)	Controls brilliance of galvanometer lamp I5.	3, fig. 67
	Variable resistor	R14	Rotary with lock (screw-driver adjust)	Controls brilliance of galvanometer light I9.	4, fig. 67
	Variable resistor	R18	Rotary with lock (screw-driver adjust)	Controls grid lamp brilliance.	2, fig. 67
Signal and channel relay assembly	LCHR DESIG variable resistor	R18	Rotary with lock (screw-driver adjust)	Used to calibrate the LCHR DESIG galvanometer.	

95 (C). Battery Control Console

The controls and indicators of the battery control console (13, fig. 16) are located on the alarm control, STC, PPI, modulation eliminator, PPI dc amplifier, PPI marker generator, sweep generator, PPI video amplifier, precision indicator, azimuth sweep generator mixer stage, precision mark generator, precision video amplifier, range sweep generator, target designate control-indicator, and acquisition range generator. These controls and indicators are described in alphabetical order in table 57. The nonplacarded controls and indicators are shown on the referenced figures.

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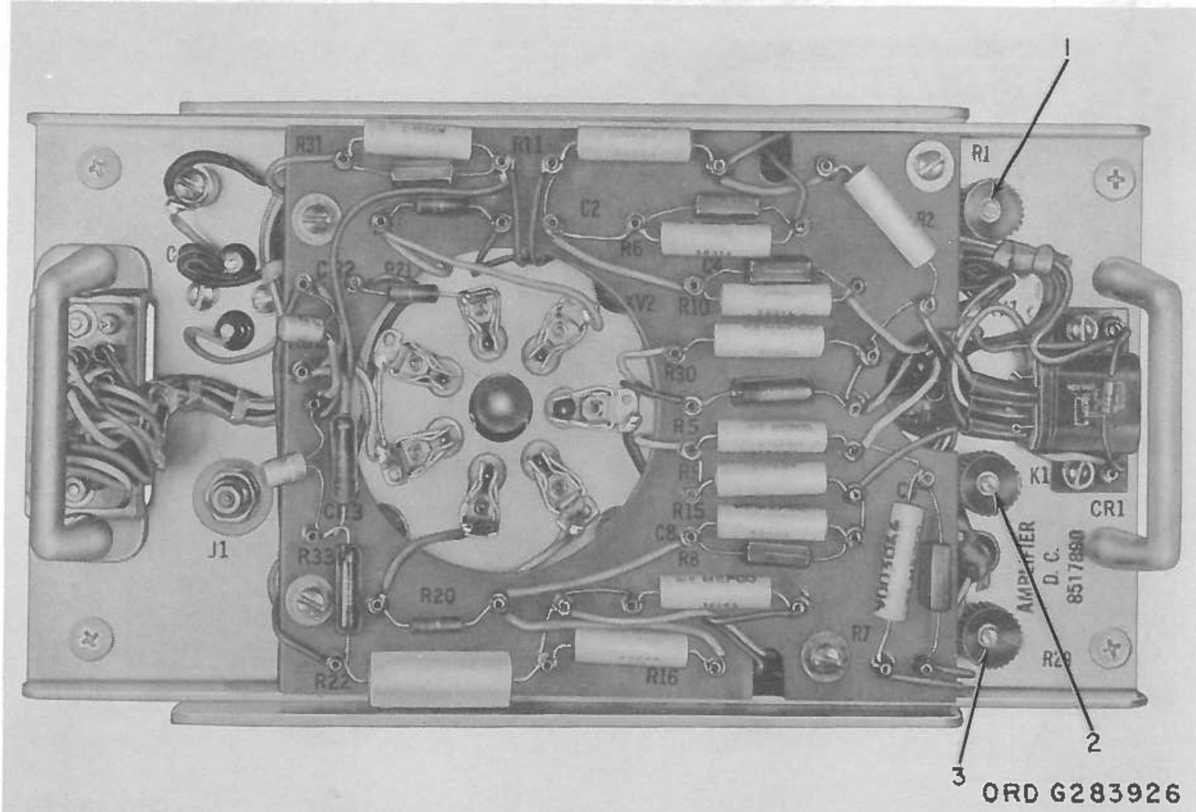

Figure 68 (U). PPI dc amplifier—nonplacarded controls (U).

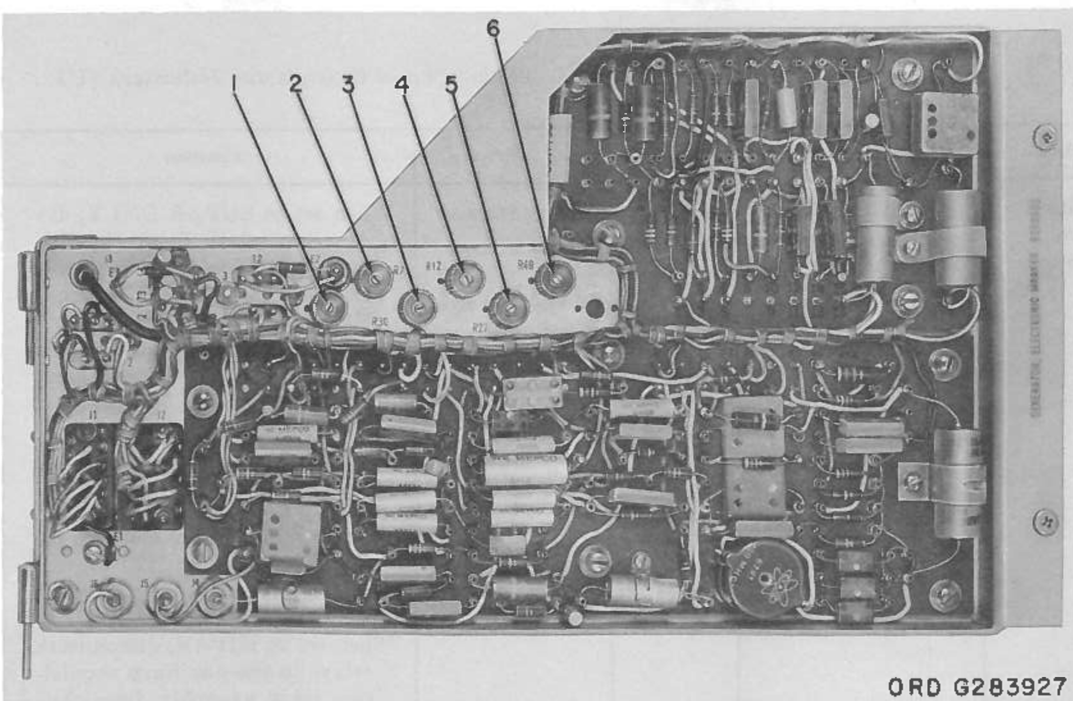

Figure 69 (U). PPI marker generator—nonplacarded controls (U).

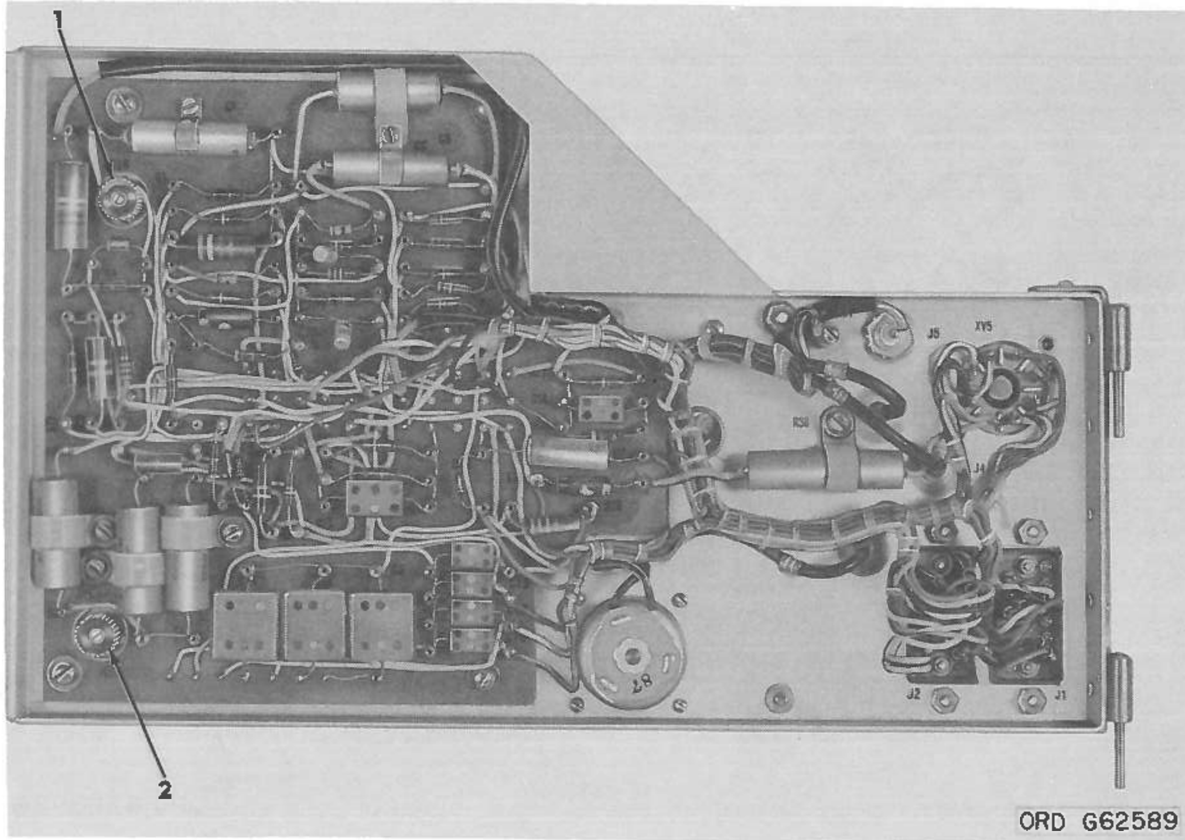

Figure 70 (U). PPI video amplifier—nonplacarded controls (U).

Table 57 (U). Battery Control Console—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Acquisition control-indicator	ACQUISITION RADAR switch	S1	Rotary (three-position)	When set to LOPAR ONLY, disconnects relays in the auxiliary acquisition relay assembly from CONT TRANS switch S11 and applies a ground to squelch interlock relay K11 in the auxiliary acquisition relay assembly causing it to energize. When set to AAR, connects the CONT TRANS switch S11 on the LOPAR control-indicator to the transmitter control, receiver control, and MTI control relays in the auxiliary acquisition control-indicator. When set to HIPAR, disconnects relays in the auxiliary acquisition relay assembly from the CONT TRANS switch S11 and	

Table 57 (U). Battery Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Acquisition control-indicator—Continued				applies a ground to squelch interlock relay K11 in the auxiliary acquisition relay assembly causing it to energize.	
Alarm control	PWR SENS variable resistor	R3	Rotary with lock (screwdriver adjust)	To determine the voltage level at which the HIPAR POWER indicator illuminates.	
STC	FLAT variable resistor	R2	Rotary with lock (screwdriver adjust)	Eliminates noise between preknock and transmitter pulses.	
	DURATION variable resistor	R13	Rotary with lock (screwdriver adjust)	Determines maximum STC range.	
AAR control-indicator	RANGE GATE DURATION	S2	Toggle (two-position) NOR—OFF	When in OFF position, the control for the AAR range gate is disabled. When in NOR position, the AAR range gate duration is controlled from the front panel when the NORMAL RECEIVER or the ECCM 1 receiver mode is selected.	
	LINEAR RCVR	S7	Toggle (two-position) NOR—OFF	When in OFF position, the linear receiver function of the AAR is disabled. When in NOR position, the linear receiver function is controlled from the front panel controls.	
	INTEGRATOR	S11	Toggle (two-position) NOR—OFF	When in OFF position, the integrator function is disabled. When in NOR position, the integrator function is not disabled.	
	SL BLANKING	S12	Toggle (two-position) NOR—OFF	When in OFF position, the SL BLANKING function is disabled. When in NOR position, the SL BLANKING function is not disabled.	
	LOGIC	S8	Toggle (two-position) NOR—OFF	When in OFF position, the LOGIC function is disabled. When in NOR position, the LOGIC function is controlled from the front panel controls.	
	AZ STROBE	S10	Toggle (two-position) NOR—OFF	When in OFF position, the AZ STROBE function is disabled. When in NOR position, the AZ STROBE function is controlled from the front panel controls.	

Table 57 (U). Battery Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
AAR control-indicator—Continued	MTI DF	S9	Toggle (two-position) NORMAL—OFF	When in OFF position, the MTI DF function is disabled. When in NORMAL position, MTI DF function is controlled from the front panel controls.	
PPI	ACQ RANGE MARK variable resistor	R4	Rotary with lock (screw-driver adjust)	Adjusts acquisition range mark intensity on the steerable azimuth line.	
	CENTER EXP ADJ variable resistor	R22	Rotary with lock (screw-driver adjust)	Adjusts the sweep origin when the EXPANSION switch is set to ON.	
	DIAMETER EXP ADJ variable resistor	R21	Rotary with lock (screw-driver adjust)	Adjusts sweep size when the EXPANSION switch is in the ON position.	

Table 57 (U). Battery Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Acquisition control-indicator—Continued				applies a ground to squelch interlock relay K11 in the auxiliary acquisition relay assembly causing it to energize.	
Alarm control	PWR SENS variable resistor	R3	Rotary with lock (screwdriver adjust)	To determine the voltage level at which the HIPAR POWER indicator illuminates.	
STC	FLAT variable resistor	R2	Rotary with lock (screwdriver adjust)	Eliminates noise between preknock and transmitter pulses.	
	DURATION variable resistor	R13	Rotary with lock (screwdriver adjust)	Determines maximum STC range.	
PPI	ACQ RANGE MARK variable resistor	R4	Rotary with lock (screwdriver adjust)	Adjusts acquisition range mark intensity on the steerable azimuth line.	
	CENTER EXP ADJ variable resistor	R22	Rotary with lock (screwdriver adjust)	Adjusts the sweep origin when EXPANSION switch is set to ON.	
	DIAMETER EXP ADJ variable resistor	R21	Rotary with lock (screwdriver adjust)	Adjusts sweep size when EXPANSION switch is in the ON position.	

Table 57 (U). Battery Control Console—Behind Panel Controls and Indicators—Continued (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
PPI—Continued	FOCUS variable resistor	R24	Rotary with lock (screw-driver adjust)	Focuses the PPI presentation.	
Modulation eliminator (systems 1181 and above)	Y OFF—NORM—X OFF switch	S1	Rotary (three-position)	When set to Y OFF, removes sweep in Y axis of PPI. When set to X OFF, removes sweep in X axis of PPI. When set to NORM, both sweeps are presented on the PPI.	
Modulation eliminator (systems 1001 to 1180)	ZERO SET—X switch	S2	Toggle (two-position)	When set to ON, the E—W sweep is present on the PPI. When set to OFF, removes the E—W sweep from the PPI.	
	ZERO SET—Y switch	S1	Toggle (two-position)	When set to ON, the N—S sweep is present on the PPI. When set to OFF, removes the N—S sweep from the PPI.	
PPI dc amplifier	DC balance variable resistor	R4	Rotary with lock (screw-driver adjust)	Controls the dc amplifier output potential when it is in the quiescent condition.	2, fig. 68
	Gain adjust variable resistor	R1	Rotary with lock (screw-driver adjust)	Controls the gain of the dc amplifier.	1, fig. 68
	Zero set variable resistor	R29	Rotary with lock (screw-driver adjust)	Balances the dc amplifier.	3, fig. 68
PPI marker generator	Gate pulse adjust variable resistor	R49	Rotary with lock (screw-driver adjust)	Adjusts the bias applied to V6B.	6, fig. 69
	Oscillator level variable resistor	R27	Rotary with lock (screw-driver adjust)	Corrects for the ringing factor of the sync wave used to produce the symbols.	5, fig. 69
	Pedestal adjust variable resistor	R12	Rotary with lock (screw-driver adjust)	Adjusts the amplitude of the marker pedestal.	4, fig. 69
	Write pulse adjust variable resistor	R71	Rotary with lock (screw-driver adjust)	Adjusts the bias of V1B.	2, fig. 69
	X amplitude variable resistor	R30	Rotary with lock (screw-driver adjust)	Determines symbol size in X coordinates.	3, fig. 69
	Y amplitude variable resistor	R74	Rotary with lock (screw-driver adjust)	Determines symbol size in Y coordinates.	1, fig. 69
PPI video amplifier	Pedestal adjust variable resistor	R33	Rotary with lock (screw-driver adjust)	Adjusts the amplitude of the pedestal to a point where the sweep is just visible.	2, fig. 70
	Range adjust variable resistor	R18	Rotary with lock (screw-driver adjust)	Adjusts the length of the range sweep gate.	1, fig. 70
Sweep generator	CENTERING—X variable capacitor	C10	Rotary	Centers the sweep horizontally.	
	CENTERING—Y variable capacitor	C5	Rotary	Centers the sweep vertically.	

Table 57 (U). Battery Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
PPI—Continued Sweep generator—Continued	X BAL variable resistor	R22	Rotary with lock (screwdriver adjust)	Balances X sweep in east-west quadrants.	
	X SLOPE ADJ variable resistor	R18	Rotary with lock (screwdriver adjust)	Adjusts vertical sweep to a calibrated length.	
	X ZERO SET variable resistor	R24	Rotary with lock (screwdriver adjust)	Eliminates the X axis component from Y axis dc amplifier.	
	Y BAL variable resistor	R5	Rotary with lock (screwdriver adjust)	Balances sweep in north-south quadrants.	
	Y SLOPE ADJ variable resistor	R1	Rotary with lock (screwdriver adjust)	Adjusts horizontal sweep to a calibrated length.	
	Y ZERO SET variable resistor	R7	Rotary with lock (screwdriver adjust)	Eliminates the Y axis component from the X axis dc amplifier.	
Precision indicator	FOCUS control knob		Mechanical	Focuses electron beam.	
	H CENT control knob		Mechanical	Centers sweep presentation horizontally.	
	VERT CENT control knob		Mechanical	Centers sweep presentation vertically.	
Azimuth sweep generator mixer stage	AZ ADJ variable resistor	R2	Rotary with lock (screwdriver adjust)	Adjusts unblanked area on precision indicator.	
	BAL ADJ variable resistor	R17	Rotary with lock (screwdriver adjust)	Centers unblanked area on precision indicator.	
Precision mark generator	4KC ADJ variable resistor	R20	Rotary with lock (screwdriver adjust)	Adjusts the 4-kc signal at TP1 to minimize and maximize once per revolution.	
	GATE ADJ variable resistor	R10	Rotary with lock (screwdriver adjust)	Adjusted to obtain only one acquisition azimuth line per antenna revolution.	
	MARK LENGTH HIPAR variable resistor	R43	Rotary with lock (screwdriver adjust)	Adjusts the length of the acquisition azimuth line on the PPI when in HIPAR mode of operation.	
	MARK LENGTH LOPAR variable resistor	R32	Rotary with lock (screwdriver adjust)	Adjusts the length of the acquisition azimuth line on the PPI when in LOPAR mode of operation.	
Precision video amplifier	AZ BLANK ADJ variable resistor	R2	Rotary with lock (screwdriver adjust)	Adjusts azimuth unblanking of precision indicator sweep.	
Range sweep generator	Range adjust variable resistor	R2	Rotary with lock (screwdriver adjust)	Centers range mark vertically on the precision indicator.	
Target designate control-indicator	BAL 1 switch	S7	Pushbutton	Grounds the tachometer output.	
	BAL 1 variable resistor	R20	Rotary with lock (screwdriver adjust)	Balances out range drift when S7 is depressed.	

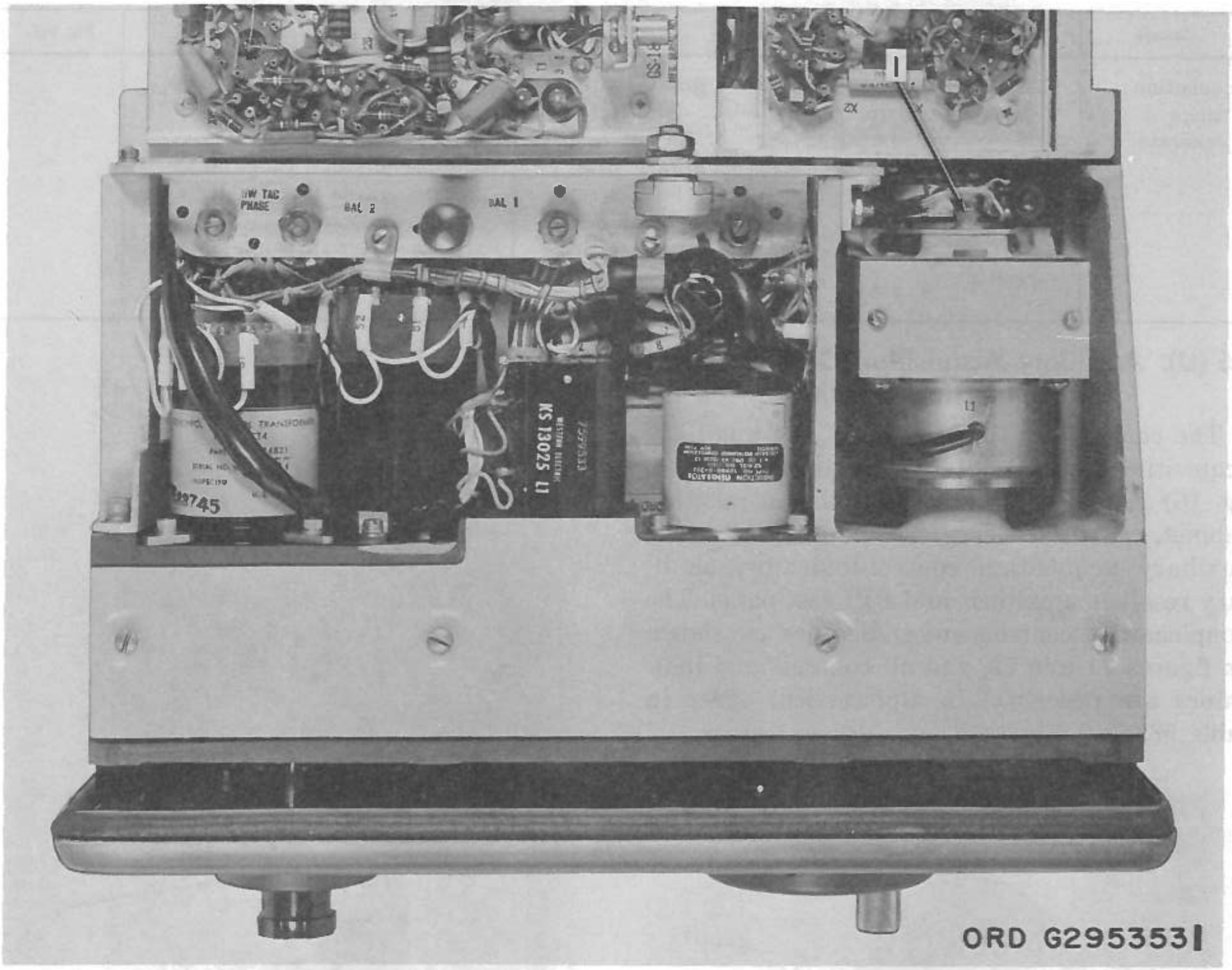

Figure 70.1 (U). Target designate control-indicator—controls (U).

Table 57 (U). Battery Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Target designate control-indicator—Continued	BAL 2 variable resistor	R14	Rotary with lock (screwdriver adjust)	Balances out the range drift.	
	HW TAC PHASE variable resistor	R2	Rotary with lock (screwdriver adjust)	Varies the impedance of the excitation winding in range generator B5.	
	RANGE RATE variable resistor	R21	Rotary with lock (screwdriver adjust)	Adjusts tachometer voltage amplitude.	
	RANGE TAC PHASE variable resistor	R4	Rotary with lock (screwdriver adjust)	Varies the impedance of the excitation winding in the range drive motor-generator B4.	
	Rate variable resistor	R3	Mechanical (lever)	Balances out the range drift when the MAN-AID switch is in the AID position.	1, fig. 70.1

Table 57 (U). Battery Control Console—Behind Panel Controls and Indicators—Continued (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Acquisition range generator	GATE LENGTH variable resistor	R20	Rotary with lock (screw-driver adjust)	Adjusts range gate to control precision indicator range sweep length.	
	RATE variable resistor	R13	Rotary with lock (screw-driver adjust)	Varies acquisition range at 200,000 yards to coincidence with target range.	
	ZERO variable resistor	R2	Rotary with lock (screw-driver adjust)	Varies acquisition range at 20,000 yards to coincidence with target range.	

96 (U). Auxiliary Acquisition Control Interconnecting Group

The controls and indicators of the auxiliary acquisition control interconnecting group (6, fig. 16) are located on the auxiliary acquisition cabinet, LOPAR auxiliary control-indicator, auxiliary acquisition control-indicator, auxiliary resolver amplifier, and PPI test panel. The nonplacarded controls and indicators are shown on figures 71 and 72, and all controls and indicators are described in alphabetical order in table 58.

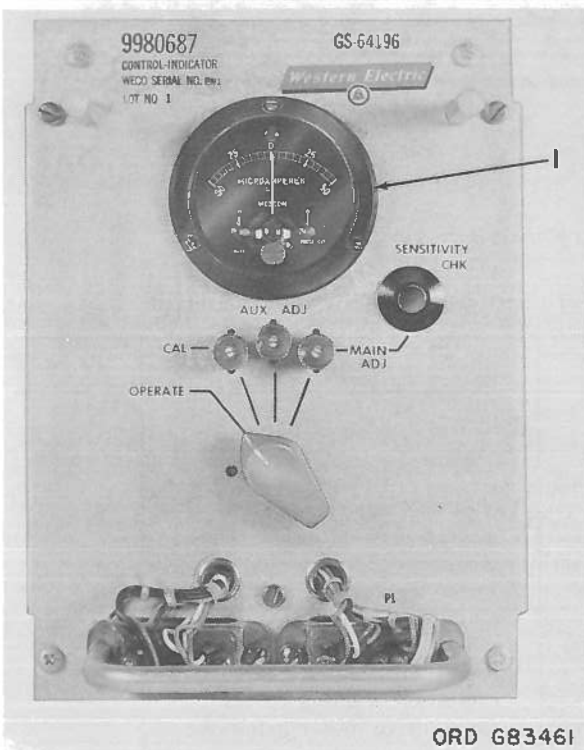

Figure 71 (U). Auxiliary acquisition control-indicator —nonplacarded controls and indicators (U).

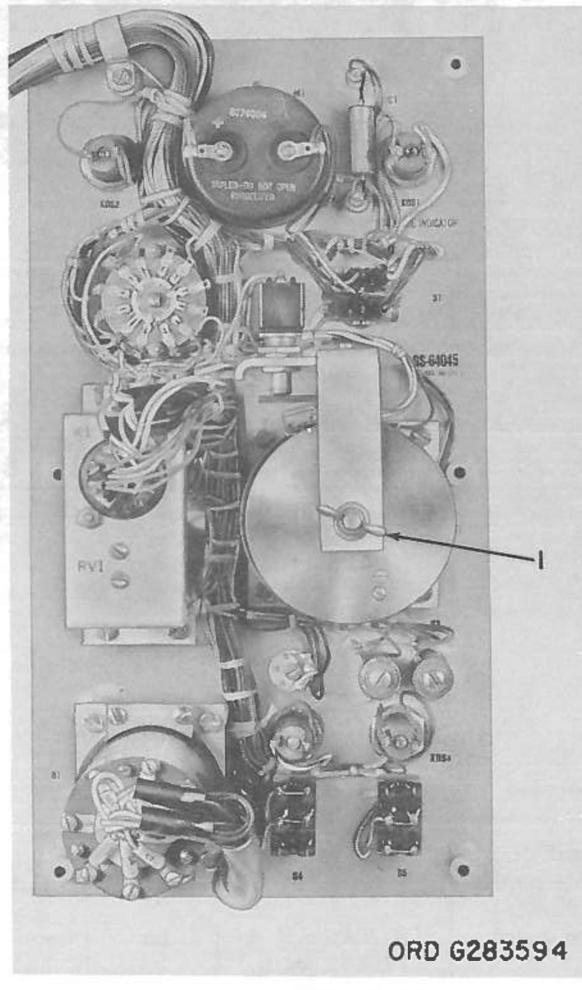

Figure 72 (U). LOPAR auxiliary control-indicator— transformer stop control (U).

Table 58 (U). Auxiliary Acquisition Control Interconnecting Group—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Auxiliary acquisition cabinet	HIPAR ANT RPM switch	S5	Toggle (two-position)	When set to 6, HIPAR antenna rotates at 6 rpm. When set to 10, HIPAR antenna rotates at 10 rpm.	
Auxiliary acquisition control-indicator	AUX ADJ variable resistor	R11	Rotary with lock (screwdriver adjust)	Adjusts gain of auxiliary channel.	
	CAL variable resistor	R16	Rotary with lock (screwdriver adjust)	Adjusts for meter zero of meter M1.	
	Gain meter	M1		Indicates relative gain of main and auxiliary receiver channels.	1, fig. 71
	MAIN ADJ variable resistor	R7	Rotary with lock (screwdriver adjust)	Adjusts the gain of main channel (for test only).	
	OPERATE—CAL—AUX ADJ—MAIN ADJ switch	S1	Rotary (four-position)	Selects one of three test conditions: CAL allows zero setting of gain meter, AUX ADJ allows adjustment of gain of strobe channel, and OPERATE for normal operation.	
	SENSITIVITY CHK switch	S2	Pushbutton	Energizes the main and auxiliary noise generators to check the effectiveness of the strobe channel.	
Auxiliary resolver amplifier	E–W gain variable resistor	R27	Rotary with lock (screwdriver adjust)	Adjusts amplitude of HIPAR resolver E–W output voltage.	
	N–S gain variable resistor	R15	Rotary with lock (screwdriver adjust)	Adjusts amplitude of HIPAR resolver N–S output voltage.	
Filter assembly	Switch	S1C	Rotary (five-position)	Switches in capacitance to compensate for inductive loading on the E–W and N–S quadrature voltages from the HIPAR or AAR antenna resolver.	
	Switch	S2L	Rotary (five-position)	Switches in inductance to compensate for capacitive loading on the E–W and N–S quadrature voltages from the HIPAR or AAR antenna resolver.	
LOPAR auxiliary control-indicator	Transformer T1 stop control	T1	Screw	Allows positioning of HV power supply stops.	1, fig. 72
PPI test panel	GEN ADJUST variable resistor	R1	Rotary with lock (screwdriver adjust)	Adjusts pulse generator frequency.	
	PULSE GENERATOR indicator light	DS1	Clear	When illuminated, indicates the pulse rate of the pulse generator.	
	TEST switch	S1	Rotary (nine-position)	Applies flashing spot to PPI to permit centering PPI presentation.	

97 (U). Computer Power Suppy Group

The controls of the computer power supply group (3C, fig. 16) are located on the 20–30 second delay timer, +270v, −28v and +75v or +175v power supply, and ±320v or +220v power supply. These controls are described in table 59.

Table 59 (U). Computer Power Supply Group—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
20–30 second delay	Delay time variable resistor	R11	Rotary with lock (screwdriver adjust)	Varies time interval.	
+270v, −28v and +75v or +175v power supply	10A— −28v fuse indicator	I1	Red	When illuminated, indicates associated fuse F1 has blown.	1, fig. 64
±320v or 220v power supply	V ADJ SEC 1 (+) variable resistor	R22	Rotary with lock (screwdriver adjust)	Adjusts voltage output.	
	V ADJ SEC 2 (− OR +) variable resistor	R42	Rotary with lock (screwdriver adjust)	Adjusts voltage output.	

98 (U). Servo Computer Assembly

The controls and indicators of the servo computer assembly (3B, fig. 16) are on the computer servo cabinet, transit time servo, velocity correction servo, climb and turn computer, time-to-intercept computer, A_G, B and T_D computer, and computing modulators. The nonplacarded controls are shown on figure 73 and all controls and indicators are described in alphabetical order in table 60.

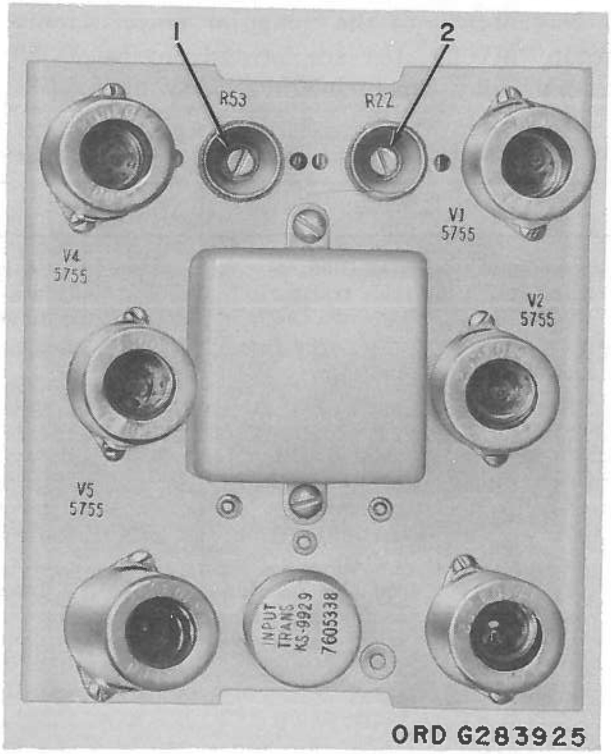

Figure 73 (U). Computing modulator—nonplacarded controls (U).

Table 60 (U). Servo Computer Assembly—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
A_G, B, and T_D computer	Ballistic elevation variable resistor adjustment		Rotary	Controls the manual setting of the BALLISTIC EL dial.	
	Dead time variable resistor adjustment		Rotary	Controls the manual setting of the DEAD TIME dial.	
	Gyro azimuth variable resistor adjustment		Rotary	Controls the manual setting of GYRO AZIMUTH dial.	
Climb and turn computer	Climb angle variable resistor adjustment		Rotary	Controls the manual setting of the CLIMB ANGLE dial.	
	DRIFT CHECK (P TST) PROB 7 switch	S7	Pushbutton	Removes the inputs to the −VC circuits.	
	DRIFT CHECK (P TST) PROB 8 switch	S6	Pushbutton	Removes the inputs to the +DO and −GB circuits.	
	Turn angle variable resistor adjustment		Rotary	Controls the manual setting of the TURN ANGLE dial.	

Table 60 (U). Servo Computer Assembly—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Computing modulator (4)	Modulator balance variable resistor	R23	Rotary with lock (screw-driver adjust)	Used to balance associated computing modulator.	2, fig. 73
	Modulator balance variable resistor	R53	Rotary with lock (screw-driver adjust)	Used to balance associated computing modulator.	1, fig. 73
Computer servo cabinet	BURST indicator light	I3	Red	Indicates an actual or synthetic missile burst.	
	BURST TIME BIAS dial			Indicates the time of burst order ahead of zero computed time.	
	BURST TIME BIAS variable resistor	R3	Rotary (knob adjust)	Controls the setting of the BURST TIME BIAS dial.	
	CLUSTER—CLU switch	S10	Toggle (two-position)	When set to TEST, connects the S10 CLU test circuits. When set to NORMAL, leaves normal operating circuits unaffected.	
	CLUSTER—LEC switch	S8	Toggle (two-position)	When set to TEST, connects the LEC test circuits. When set to NORMAL, leaves normal operating circuits unaffected.	
	CLUSTER—SMLT switch	S9	Toggle (two-position)	When set to TEST, connects the SMLT test circuits. When set to NORMAL, leaves normal operating circuits unaffected.	
	FINAL DIVE TIME dial			Indicates time-to-intercept at which final dive starts in surface-to-surface missions.	
	FINAL DIVE TIME variable resistor	R2	Rotary (knob adjust)	Controls the setting of the FINAL DIVE TIME dial.	
	HT DISPLACE dial			Indicates the altitude that the aiming point is displaced during surface-to-surface missions.	
	HT DISPLACE variable resistor	R1	Rotary (knob adjust)	Controls the setting of the HT DISPLACE dial.	
	HT OF SITE dial			Indicates altitude of target tracking radar above sea level.	
	HT OF SITE variable resistor	R4	Rotary (knob adjust)	Controls the setting of the HT OF SITE dial.	
	ORDER CALIBRATE switch	S4	Rotary (three-position)	Used to command calibrate missiles remotely, provided the following conditions are met. (1) COMPUTER CONDITION switch to STANDBY. (2) COMMAND ORIGIN switch on the electrical test panel in the radar coder set (table 62) is set to NORMAL. (3) Missile tracking radar is locked on a missile.	

Table 60 (U). Servo Computer Assembly—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Computer servo cabinet—Continued				When set to +, the missile tracking radar transmits positive fin orders to the missile. When set to 0, the missile tracking radar transmits 0 fin orders to the missile. When set to —, the missile tracking radar transmits negative fin orders to the missile.	
	RUNDOWN TEST switch	S5	Toggle (two-position, springloaded to up)	Connects test signal voltage to the VC circuits.	
Time-to-intercept computer	TIME TO INTERCEPT dial			Indicates time to intercept.	
	Time to intercept variable resistor adjustment		Rotary	Controls the manual setting of the TIME TO INTERCEPT dial.	
Transit time servo	TRANSIT TIME dial			Indicates the transit time value.	
	Transit time variable resistor adjustment		Rotary	Controls the manual setting of the TRANSIT TIME dial.	
Velocity correction servo	VELOCITY CORRECTION dial			Indicates the percentage of velocity correction.	
	Velocity correction variable resistor adjustment		Rotary	Controls the manual setting of the VELOCITY CORRECTION dial.	

99 (U). Computer Amplifier-Relay Group

The controls and indicators of the computer amplifier-relay group (3A, fig. 16) are located on the left swinging frame-computer amplifier-relay group subassembly, zero-set switches, relay amplifiers, mark relay assembly, initial turn control relay assembly, computing modulators, right swinging frame-computer amplifier-relay group subassembly, and motor burn-out timer. The nonplacarded controls and indicators are shown on figures 17, 73, and 74 and all controls and indicators are described in alphabetical order in table 61.

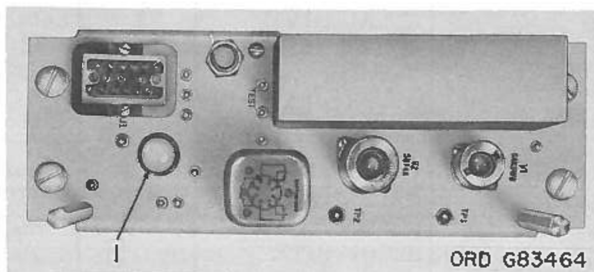

Figure 74 (U). Motor burn-out timer—nonplacarded controls and indicator (U).

Table 61 (U). Computer Amplifier-Relay Group—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
	DYN TEST—ENABLE switch	S822	Pushbutton	Applies a synthetic missile tracked signal to computer, opens the fire signal channel to the launcher area, and illuminates the TEST indicator light.	
	DYN TEST—RELEASE switch	S822	Pushbutton	Removes the synthetic missile tracked signal, and restores the circuits modified by the DYN TEST—ENABLE switch.	
	ORIENT CHECK—ENABLE switch	S826	Pushbutton	Replaces the missile radar inputs to the computer with target radar inputs.	
	ORIENT CHECK—RELEASE switch	S826	Pushbutton	Restores the inputs to the computer removed by the ORIENT CHECK—ENABLE switch, and removes those inputs introduced by the ORIENT CHECK—ENABLE switch.	
	ZERO CHECK—ENABLE switch	S825	Pushbutton	Removes dc voltages from data variable resistors and static test voltage divider networks.	
	ZERO CHECK—RELEASE switch	S821	Pushbutton	Restores the dc voltages removed by the ZERO CHECK—ENABLE switch.	
Computing modulators (4)	Modulator balance variable resistor	R23	Rotary with lock (screwdriver adjust)	Used to balance associated computing modulator.	2, fig. 73
	Modulator balance variable resistor	R53	Rotary with lock (screwdriver adjust)	Used to balance associated computing modulator.	1, fig. 73
Initial turn control relay assembly	MA TO RS TIME ADJ variable resistor	R111	Rotary with lock (screwdriver adjust)	Controls the timed duration between MA and MA+4 seconds.	
Left swinging frame-computer amplifier-relay group subassembly	GROUP 1—GROUP 2 zero check switch	S20	Rotary (24-position)	Selects amplifiers in groups 1 and 2 and connects them into circuit being monitored.	2, fig. 17
	GROUP 3—GROUP 4 zero check switch	S21	Rotary (24-position)	Selects amplifiers in groups 3 and 4 and connects them into circuit being monitored.	3, fig. 17
	GROUP 5 zero check switch	S22	Rotary (14-position)	Selects amplifiers in group 5 and connects them into circuit being monitored.	4, fig. 17
	INTERNAL—EXTERNAL switch	S1	Toggle (two-position)	When set to INTERNAL, connects the ZERO CHECK meter into the circuit. When set to EXTERNAL, connects EXT TEST connector into the circuit.	
	SENSITIVITY switch	S2	Pushbutton	Bypasses a resistor network for greater meter sensitivity.	
	ZERO CHECK meter	M17		Indicates amplifier output during zero check.	
Zero-set switch (5)	Unbalance indicator light transfer switch	S2	Pushbutton	When depressed, closes overload signal path through unbalance indicator light to ground.	11, fig. 17

Table 61 (U). Computer Amplifier-Relay Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Mark relay assembly	TIME INTER-VAL ADJ variable resistor	R92	Rotary with lock (screw-driver adjust)	Controls the timing cycle for operation of the time interval relays.	
Motor burn-out timer	Test indicator light	I1	Ivory	When illuminated, indicates completion of the motor burn-out timer period.	1, fig. 74
	TEST switch	S1	Pushbutton	Connects the motor burnout timer circuit.	
Relay amplifier (6)	OUTPUT TEST—ADJ variable resistor	R17	Rotary with lock (screw-driver adjust)	Controls the relay amplifier circuit balance.	
	OUTPUT TEST indicator light	I1	Ivory	When illuminated, indicates circuit balance at threshold illumination.	
	OUTPUT TEST switch	S1	Pushbutton	Removes signal input to relay amplifier.	
Right swinging frame-computer amplifier-relay group subassembly	+250 BAL—ADJUST knob	R/S305	Switch/knob (depress to adjust)	Balance output of +250 volt regulator against output of −250 volt regulator (systems 1219 and above).	
	+250 V BAL switch	S571	Toggle (two-position, springloaded to right)	When operated, connects −250 volts to the null voltage test set (systems 1218 and below).	
	+250 V BAL variable resistor	R571	Rotary with lock (screw-driver adjust)	Balances output of +250 volt regulator against output of −250 volt regulator (systems 1218 and below).	
	GROUP 6—GROUP 7 zero check switch	S320	Rotary (24-position)	Selects amplifiers in groups 6 and 7 and connects them into circuit for monitoring.	6, fig. 17
	GROUP 8—GROUP 9 zero check switch	S321	Rotary (24-position)	Selects amplifiers in groups 8 and 9 and connects them into circuit for monitoring.	7, fig. 17
	GROUP 10 zero check switch	S322	Rotary (12-position)	Selects amplifiers in group 10 and connects them into circuit for monitoring.	8, fig. 17
	INTERNAL—EXTERNAL switch	S301	Toggle (two-position)	When set to INTERNAL, connects the ZERO check meter into the circuit. When set to EXTERNAL, connects EXT TEST connector into the circuit.	
	SENSITIVITY switch	S302	Pushbutton	Bypasses a resistor network for greater meter sensitivity.	
	ZERO CHECK meter	M317		Indicates amplifier output during zero check.	
Zero-set switch (5)	Unbalance indicator light transfer	S2	Pushbutton	When depressed, closes overload signal path through unbalance indicator light to ground.	6, fig. 17

Section II (C). TRAILER MOUNTED TRACKING STATION

100 (U). Radar Coder Set

The controls and indicators of the radar coder set (15, fig. 28) are located on the electrical test panel, coder control-indicator, pulse repetition generator, battery command radar coder, and radar pitch and yaw coder. These controls and indicators are described in alphabetical order in table 62.

Table 62 (U). Radar Coder Set—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function
Battery command radar coder	COMMAND PULSE indicator light	I1	Amber	When illuminated, indicates presence of command pulses.
	PITCH TIMING MAX variable resistor	R32	Rotary with lock (screwdriver adjust)	Used to adjust for maximum pitch command.
	PITCH TIMING MIN variable resistor	R35	Rotary with lock (screwdriver adjust)	Used to adjust for minimum pitch command.
	YAW TIMING MAX variable resistor	R93	Rotary with lock (screwdriver adjust)	Used to adjust for maximum yaw command.
	YAW TIMING MIN variable resistor	R95	Rotary with lock (screwdriver adjust)	Used to adjust for minimum yaw command.
Coder control-indicator	BATTERY CODE —CODE 1 ADJ variable resistor	R9	Rotary (knob adjust)	Sets upper limit of voltage divider for code adjustment.
	BATTERY CODE —CODE 16 ADJ variable resistor	R8	Rotary (knob adjust)	Sets lower limit of voltage divider for code adjustment.
	BATTERY CODE TEST variable resistor	R11A, R11B, S2	Rotary (spring-loaded to out position)	Used to test for proper centering of no. 2 pulse.
	BATTERY P-Y CODE—CODE 1 ADJ variable resistor	R26	Rotary (knob adjust)	Sets upper limit of voltage divider for position of no. 3 pulse.
	BATTERY P-Y CODE—CODE 16 ADJ variable resistor	R27	Rotary (knob adjust)	Sets lower limit of voltage divider for position of no. 3 pulse.
	BATTERY P-Y CODE TEST variable resistor	R29A, R29B, S3	Rotary (spring-loaded to out position)	Used to test for proper centering of no. 3 pulse.
	BURST ENABLE indicator light	I5	Red	Illuminates when burst enable command is generated.
	BURST ORDER indicator light	I6	Red	Illuminates when burst pulse is generated.
	NIKE B BATTERY CODE switch	S1	Rotary (16-position)	Selects battery code during NIKE-HERCULES mode.
	NIKE B indicator light	I3	Red	Illuminates when NIKE-HERCULES mode is selected.
	NIKE I indicator light	I4	Red	Illuminates when NIKE-AJAX mode is selected.
	NO. 1 PULSE indicator light	I7	Amber	When illuminated, indicates presence of no. 1 pulse.
	NO. 2 PULSE indicator light	I8	Amber	When illuminated, indicates presence of no. 2 pulse.

Table 62 (U). Radar Coder Set—Behind Panel Controls and Indiators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function
Coder control-indicator—Continued	NO. 3 PULSE indicator light	I9	Amber	When illuminated, indicates presence of no. 3 pulse.
	NO. 4 PULSE indicator light	I10	Amber	When illuminated, indicates presence of no. 4 pulse.
	PITCH indicator light	I2	Red	When illuminated, indicates pitch orders.
	PRE-KNOCK indicator light	I11	Amber	When illuminated, indicates presence of pre-knock pulse.
	YAW indicator light	I1	Red	When illuminated, indicates yaw orders.
Electrical test panel	BURST--EN-ABLE switch	S3	Toggle (two-position)	Initiates burst enable order for test purposes.
	BURST—ORDER switch	S2	Toggle (two-position)	Initiates burst order for test purposes.
	COMMAND ORIGIN switch	S5	Toggle (two-position)	Permits simulated commands to be initiated for test purposes.
	COMPUTER POWER FOR −7G, +7G indicator light	I2	Red	Illuminates when computer voltage is supplied to coder for calibration.
	MISSILE PRE-KNOCK indicator light	I1	Amber	When illuminated, indicates the missile pre-knock pulse is being generated.
	MISSILE RE-SPONSE TIME ADJ delay line	DL2	Rotary (knob adjust)	Adjusts delay time in missile tracking radar for missile response time of NIKE-HER-CULES missiles.
	MISSILE RE-SPONSE TIME ADJ switch	S8	Toggle (two-position)	When set to TEST, permits adjustment of MISSILE RESPONSE TIME ADJ knob.
	PITCH switch	S6	Rotary (four-position)	Initiates −7G, 0G, and +7G pitch commands for test purposes. Initiates variable commands in the VAR position by use of the VAR knob.
	PITCH—VAR knob	R12	Rotary (knob adjust)	Varies commands from −7G to +7G.
	PITCH—YAW switch	S4	Toggle (three-position)	Permits either pitch, yaw, or combination of pitch and yaw commands to be initiated.
	PRE-KNOCK switch	S1	Toggle (two-position)	Initiates a test preknock (sync) pulse.
	YAW switch	S7	Rotary (four position)	Initiates −7G, 0G, and +7G yaw commands for test purposes. Initiates variable commands in the VAR position by use of the VAR knob.
	YAW—VAR variable resistor	R22	Rotary (knob adjust)	Varies commands from −7G to +7G.
Pulse repetition generator	NO. 1 ADJ variable resistor	R49	Rotary with lock (screw-driver adjust)	Selects the proper ⅛ MC timing pip.
	PRF LIGHT indicator light	I1	Amber	When illuminated, indicates presence of PRF pulses.
	SYN LIGHT indicator light	I2	Amber	When illuminated, indicates presence of sync pulses.
Radar pitch and yaw coder	NO. 4 ADJ variable resistor	R75	Rotary with lock (screw-driver adjust)	Used to adjust the range of no. 4 pulse.
	PRE-KNOCK ADJ variable resistor	R125	Rotary with lock (screw-driver adjust)	Used to adjust for range of preknock pulses.

101 (U). Radar Power Supply Group

The controls and indicators of the radar power supply group (13, fig. 28) are located on the radar power control-indicator, +250 or +150 volt regulators, ±320v or +220v power supplies, +270v, −28v and +75v or +175v power supply, 20–30 second delay timer, +450v and +250v power supply, radar power control-indicator, and radar power supply cabinet. The nonplacarded indicators are shown on figures 64 and 75, and all controls and indicators are described in alphabetical order in table 63.

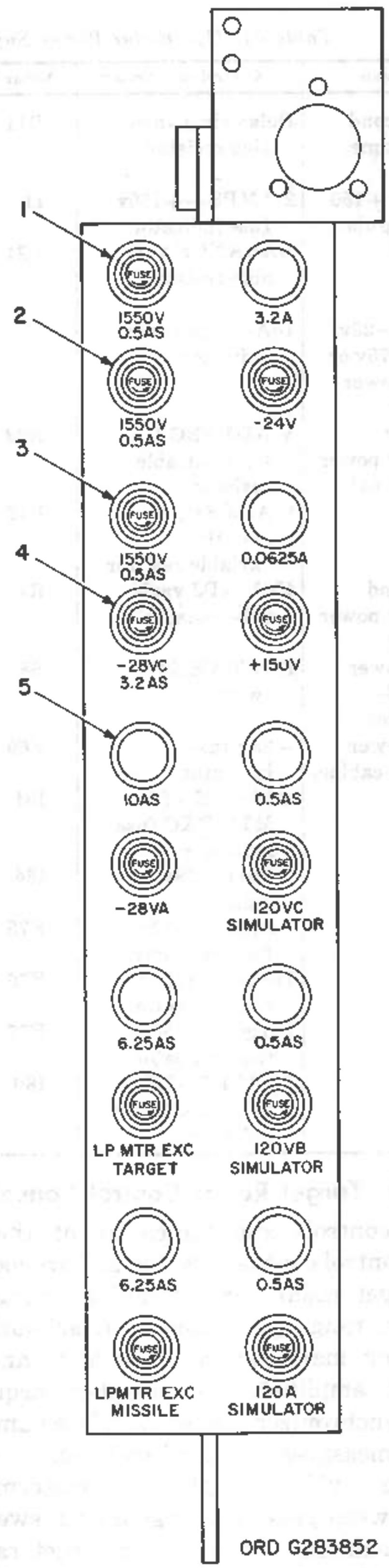

Figure 75 (U). Radar power supply group—non-placard indicators (U).

Table 63 (U). Radar Power Supply Group—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
20–30 second delay timer (2)	Delay time variable resistor	R11	Rotary with lock (screwdriver adjust)	Varies timer interval.	
+250 or +150 volt regulator (7)	2 AMPS—+150v fuse indicator	I1	Red	When illuminated, indicates associated fuse F1 has blown.	
	BALANCE variable resistor	R21	Rotary with lock (screwdriver adjust)	Adjusts output of regulator.	
+270v, −28v, and +75v or +175v power supply	10A—−28v fuse indicator	I1	Red	When illuminated, indicates associated fuse F1 has blown.	1, fig. 64
±320v or +220v power supply (4)	V ADJ SEC 1 (+) variable resistor	R22	Rotary with lock (screwdriver adjust)	Adjusts voltage output.	
	V ADJ SEC 2 (− OR +) variable resistor	R42	Rotary with lock (screwdriver adjust)	Adjusts voltage output.	
+450v and +250v power supply	450V ADJ variable resistor	R7	Rotary with lock (screwdriver adjust)	Adjusts 450-volt output of power supply.	
Radar power control-indicator	EQPT VENT switch	S8	Toggle (two-position)	Energizes the equipment cooling system in the trailer mounted tracking station.	
Radar power supply cabinet	−28v fuse indicator	F69	Red	When illuminated, indicates associated fuse F69 has blown.	4, fig. 75
	MISSILE—LP MTR EXC fuse indicator	I81	Red	When illuminated, indicates associated fuse F67 has blown.	
	Target −28v fuse indicator	I64	Red	When illuminated, indicates associated fuse F49 has blown.	5, fig. 75
	Target −1550v fuse indicator	F75	Red	When illuminated, indicates associated fuse F75 has blown.	1, fig. 75
	Target −1550v fuse indicator	F76	Red	When illuminated, indicates associated fuse F76 has blown.	2, fig. 75
	Target −1550v fuse indicator	F77	Red	When illuminated, indicates associated fuse F77 has blown.	3, fig. 75
	TARGET—LP MTR EXC fuse indicator	I80	Red	When illuminated, indicates associated fuse F66 has blown.	

102 (U). Target Radar Control Console

The controls and indicators of the target radar control console (24, fig. 28) are located on the target radar control cabinet, range error detector, range gate generator, azimuth blank generator, mark generator, azimuth and range position amplifier, test adapter, acquisition-track synchronizer, angle modulator amplifiers, countermeasures control-indicator, countermeasures video amplifier, countermeasures range sweep generator, panoramic sweep generator, azimuth, elevation, or target range indicators, target video amplifiers, target sweep generators, target track control-power supply, B scope indicator, B scope marker generator, B scope sweep generator, B scope sweep amplifier, B scope modulation eliminator, B scope video amplifier, target antenna control group, target elevation coupling resistor assembly, target azimuth coupling resistor assembly, target range coupling resistor assembly, azimuth intermediate drive control, elevation intermediate drive control, IF pre-amplifier, lin-log amplifier, and handwheel drive controls. The nonplacarded controls and indicators are shown on figures 76 through 78, and all controls and indicators are described in alphabetical order in table 64.

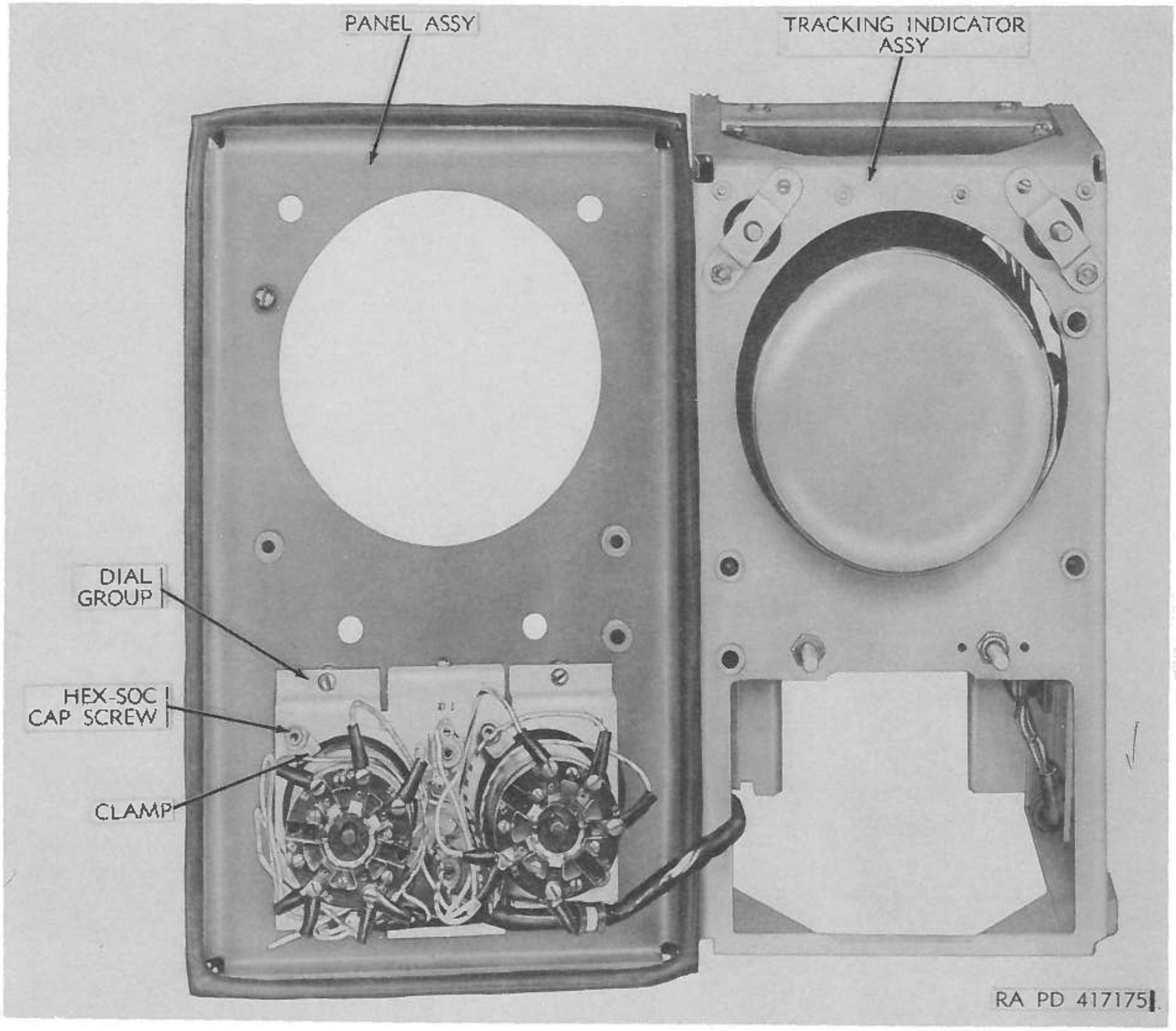

Figure 75.1 (U). Azimuth indicator-front panel open (U).

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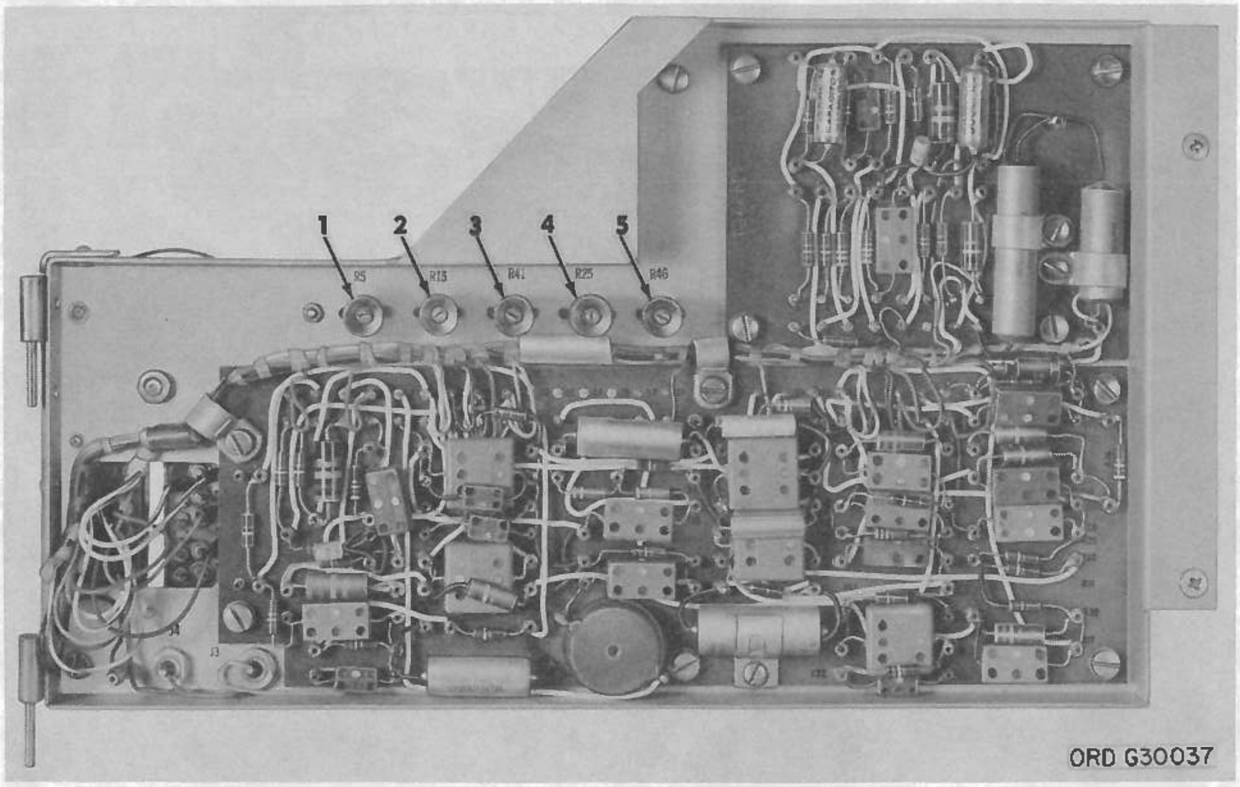

Figure 76 (U). B scope marker generator—nonplacarded controls (U).

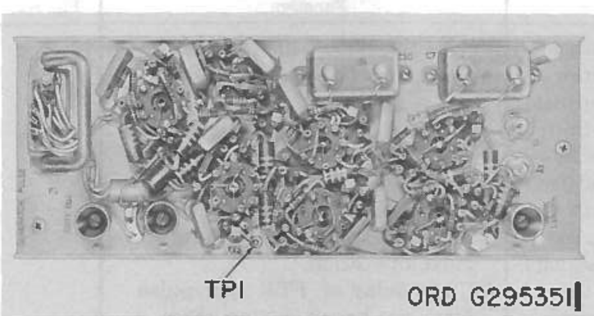

Figure 76.1 (U). Mark generator (U).

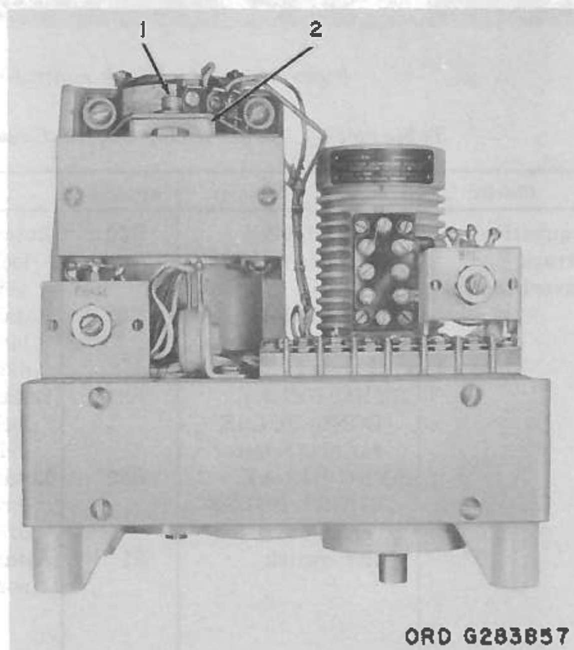

Figure 77 (U). Handwheel drive control—nonplacarded controls (U).

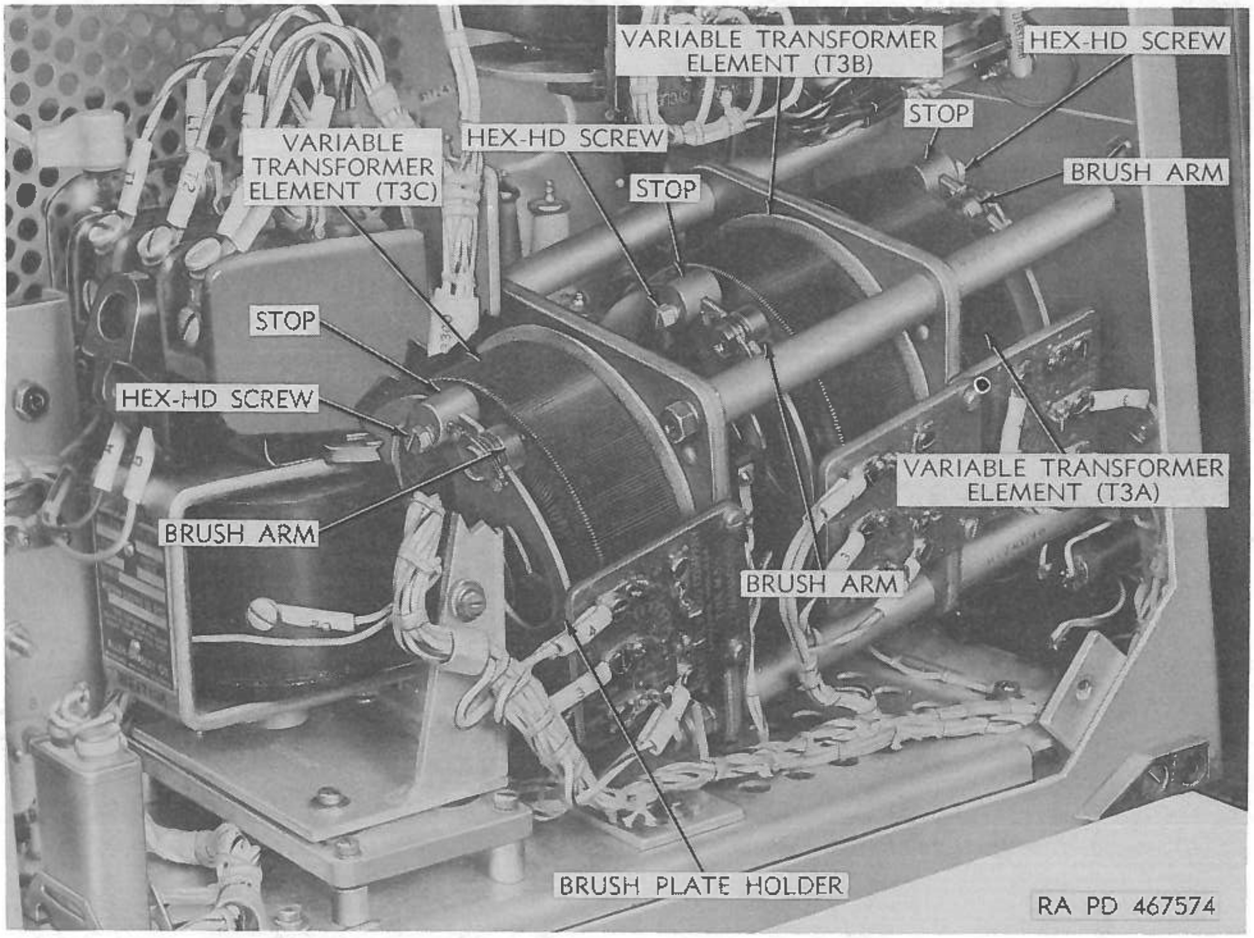

Figure 78 (U). Track control-power supply—HV stop controls (U).

Table 64 (U). Target Radar Control Console—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Acquisition-track synchronizer	FREQ HIPAR variable resistor	R50	Rotary with lock (screw-driver adjust)	Varies the pulse repetition rate when in HIPAR operation.	
	FREQ LOPAR variable resistor	R6	Rotary with lock (screw-driver adjust)	Varies the pulse repetition rate when in LOPAR operation.	
	SYNC DELAY LONG PULSE variable resistor	R21	Rotary with lock (screw-driver adjust)	Adjusts delay of TTR sync pulse from pre-knock during long pulse operation.	
	SYNC DELAY SHORT PULSE variable resistor	R52	Rotary with lock (screw-driver adjust)	Adjusts delay of TTR sync pulse from pre-knock during short pulse operation.	
	TEST switch	S1	Rotary (three-position)	Selects one of three conditions for the acquisition-track-synchronizer: INT—HIPAR FREQ for HIPAR free running PRF, INT—LOPAR FREQ for LOPAR free running PRF, and NORMAL synchronized PRF.	

Table 64 (U). Target Radar Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Angle modulator amplifier (2)	BAL variable resistor	R14	Rotary with lock (screwdriver adjust)	Adjusts input for balanced output.	
	PHASE variable resistor	R30	Rotary (knob adjust)	Adjusts phase of output with respect to the reference voltage.	
Azimuth and range position amplifier	AZ. GAIN variable resistor	R20	Rotary with lock (screwdriver adjust)	Adjusts azimuth of target track antenna circle to coincide with actual azimuth at 30°.	
	AZ. ZERO SET variable resistor	R4	Rotary with lock (screwdriver adjust)	Adjusts azimuth of target track antenna circle to coincide with actual azimuth at 0°.	
	RG GAIN variable resistor	R39	Rotary with lock (screwdriver adjust)	Adjusts gain of the range circuit of the B scope indicator.	
	RG ZERO SET variable resistor	R24	Rotary with lock (screwdriver adjust)	Adjusted to zero set the range circuit of the B scope indicator.	
Azimuth blank generator	BLANK ADJ variable resistor	R11	Rotary with lock (screwdriver adjust)	Adjusts for 60° azimuth sweep on B scope.	
	CARRIER NULL variable resistor	R3	Rotary with lock (screwdriver adjust)	Adjusts the 4-kc signal at TP1 to minimize and maximize once per antenna revolution.	
Azimuth, elevation, or target range indicator (3)	R sweep length variable resistor	R9	Rotary with lock (screwdriver adjust)	Determines sweep length during short pulse mode of operation for R type presentation.	
	Resolver clamp		Mechanical	To adjust the reading on the indicator dial to agree with the dial reading on the associated position transmitter.	fig. 75.1
Target sweep generator (3)	ASTIGMATISM variable resistor	R33	Rotary with lock (screwdriver adjust)	Corrects astigmatism in the presentation.	
	EXP WIDTH variable resistor	R42	Rotary with lock (screwdriver adjust)	Adjusts width of expanded area.	
	H CENT variable resistor	R18	Rotary with lock (screwdriver adjust)	Adjusted to center the sweep horizontally.	
	MAX SWEEP RANGE variable resistor	R9	Rotary with lock (screwdriver adjust)	Adjusts maximum range of sweep.	
	MIN. SW variable resistor	R45	Rotary with lock (screwdriver adjust)	Adjusts range of sweep in expanded position.	
	A SWEEP LG variable resistor	R2	Rotary with lock (screwdriver adjust)	Adjusts sweep length.	
Target video amplifier (2-azimuth and range)	VERT CENT variable resistor	R37	Rotary with lock (screwdriver adjust)	Adjusted to center the dual sweeps vertically.	
	VERT SPACING variable resistor	R31	Rotary with lock (screwdriver adjust)	Adjusts vertical spacing of dual sweeps.	

Table 64 (U). Target Radar Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target video amplifier (2-azimuth and range)—Continued	VIDEO GAIN variable resistor	R6	Rotary with lock (screw-driver adjust)	Adjusts amplitude of video displayed on indicators.	
Target video amplifier (elevation)	VIDEO GAIN variable resistor	R30	Rotary with lock (screw-driver adjust)	Adjusts amplitude of video displayed on indicator.	
	NOR SPACE variable resistor	R37	Rotary with lock (screw-driver adjust)	When PRESENTATION switch is set to NOR position, adjusts the vertical spacing between dual sweeps.	
	H_T SPACE variable resistor	R38	Rotary with lock (screw-driver adjust)	When PRESENTATION switch is set to H_T position, adjusts the vertical spacing between dual sweeps.	
	V LIMIT variable resistor	R34	Rotary with lock (screw-driver adjust)	Adjusts the upper sweep to keep it on face of cathode-ray tube.	
	H_T ZERO variable resistor	R35	Rotary with lock (screw-driver adjust)	When the PRESENTATION switch is set to H_T and the H_T input represents an elevation of 0 feet, adjusts for coincidence of lower trace with lowest etched line in H_T scale.	
	90K SF variable resistor	R31	Rotary with lock (screw-driver adjust)	When PRESENTATION switch is set to H_T and the H_T input represents an elevation of 90,000 feet, adjusts lower trace for coincidence with highest etched line in H_T scale.	
	300K SF variable resistor	R32	Rotary with lock (screw-driver adjust)	Not used in INH systems.	
	NOR CENT variable resistor	R33	Rotary with lock (screw-driver adjust)	When PRESENTATION switch is set to NOR, adjusts dual sweeps vertically to the center of the scope.	
B scope indicator	FOCUS variable resistor	R10	Rotary with lock (screw-driver adjust)	Adjusts focus of B scope display.	
B scope marker generator	Gate pulse adjust variable resistor	R25	Rotary with lock (screw-driver adjust)	Adjusted so target track antenna circle is visible throughout full display of B scope.	4, fig. 76
	Oscillator adjust variable resistor	R15	Rotary with lock (screw-driver adjust)	Adjusts circularity of target track antenna circle.	2, fig. 76
	Pedestal adjust variable resistor	R5	Rotary with lock (screw-driver adjust)	Adjusts amplitude of the marker pedestal.	1, fig. 76
	Symbol size variable resistor	R41	Rotary with lock (screw-driver adjust)	Adjusts size of target track antenna circle.	3, fig. 76

Table 64 (U). Target Radar Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Angle modulator amplifier (2)	BAL variable resistor	R14	Rotary with lock (screwdriver adjust)	Adjusts input for balanced output.	
	PHASE variable resistor	R30	Rotary (knob adjust)	Adjusts phase of output with respect to the reference voltage.	
Azimuth and range position amplifier	AZ. GAIN variable resistor	R20	Rotary with lock (screwdriver adjust)	Adjusts azimuth of target track antenna circle to coincide with actual azimuth at 30°.	
	AZ. ZERO SET variable resistor	R4	Rotary with lock (screwdriver adjust)	Adjusts azimuth of target track antenna circle to coincide with actual azimuth at 0°.	
	RG GAIN variable resistor	R39	Rotary with lock (screwdriver adjust)	Adjusts gain of the range circuit of the B scope indicator.	
	RG ZERO SET variable resistor	R24	Rotary with lock (screwdriver adjust)	Adjusted to zero set the range circuit of the B scope indicator.	
Azimuth blank generator	BLANK ADJ variable resistor	R11	Rotary with lock (screwdriver adjust)	Adjusts for 60° azimuth sweep on B scope.	
	CARRIER NULL variable resistor	R3	Rotary with lock (screwdriver adjust)	Adjusts the 4-kc signal at TP1 to minimize and maximize once per antenna revolution.	
Azimuth, elevation, or target range indicator (3)	R sweep length variable resistor	R9	Rotary with lock (screwdriver adjust)	Determines sweep length during short pulse mode of operation for R type presentation.	
	Resolver clamp		Mechanical	To adjust the reading on the indicator dial to agree with the dial reading on the associated position transmitter.	fig. 75.1
Target sweep generator (3)	ASTIGMATISM variable resistor	R33	Rotary with lock (screwdriver adjust)	Corrects astigmatism in the presentation.	
	EXP WIDTH variable resistor	R42	Rotary with lock (screwdriver adjust)	Adjusts width of expanded area.	
	H CENT variable resistor	R18	Rotary with lock (screwdriver adjust)	Adjusted to center the sweep horizontally.	
	MAX SWEEP RANGE variable resistor	R9	Rotary with lock (screwdriver adjust)	Adjusts maximum range of sweep.	
	MIN. SW variable resistor	R45	Rotary with lock (screwdriver adjust)	Adjusts range of sweep in expanded position.	
	A SWEEP LG variable resistor	R2	Rotary with lock (screwdriver adjust)	Adjusts sweep length.	
Target video amplifier (3)	VERT CENT variable resistor	R37	Rotary with lock (screwdriver adjust)	Adjusted to center the sweep vertically.	
	VERT SPACING variable resistor	R31	Rotary with lock (screwdriver adjust)	Adjusts vertical spacing of dual sweeps.	
	VIDEO GAIN variable resistor	R6	Rotary with lock (screwdriver adjust)	Adjusts amplitude of video displayed on indicators.	

Table 64 (U). Target Radar Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
B scope indicator	FOCUS variable resistor	R10	Rotary with lock (screw-driver adjust)	Adjusts focus of B scope display.	
B scope marker generator	Gate pulse adjust variable resistor	R25	Rotary with lock (screw-driver adjust)	Adjusted so target track antenna circle is visible throughout full display of B scope.	4, fig. 76
	Oscillator adjust variable resistor	R15	Rotary with lock (screw-driver adjust)	Adjusts circularity of target track antenna circle.	2, fig. 76
	Pedestal adjust variable resistor	R5	Rotary with lock (screw-driver adjust)	Adjusts amplitude of the marker pedestal.	1, fig. 76
	Symbol size variable resistor	R41	Rotary with lock (screw-driver adjust)	Adjusts size of target track antenna circle.	3, fig. 76
	Write pulse adjust variable resistor	R46	Rotary with lock (screw-driver adjust)	Adjusted to correct trailing edge position of target track antenna circle.	5, fig. 76
B scope modulation eliminator	NORMAL—LIMIT—OFF switch	S3	Toggle (two-position)	When set to LIMIT, limits the sweep output voltage to ±10 volts. When set to OFF, allows a true measurement of the sweep output voltage at SWP test point TP1.	
	POS—ZERO switch	S2	Toggle (two-position)	Removes TTR azimuth position input to B scope in zero position. Normal position is POS.	
	SWP AMP variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts amplitude of acquisition azimuth input in zero position. Normal position is SWP.	
	SWP—ZERO switch	S1	Toggle (two-position)	Removes acquisition azimuth input to the B scope in zero position. Normal position is SWP.	
B scope sweep amplifier	DC BAL variable resistor	R4	Rotary with lock (screw-driver adjust)	Adjusts level of sweep amplifier output.	
	GAIN SET variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts gain of sweep amplifier.	
	Phase tuning variable capacitor	C17	Rotary (screw-driver adjust)	Adjusts symmetry of circle.	
	ZERO SET variable resistor	R29	Rotary with lock (screw-driver adjust)	Adjusted to balance sweep amplifier.	
B scope sweep generator	Azimuth zero set variable resistor	R24	Rotary with lock (screw-driver adjust)	Adjusted to center azimuth sweep.	
	Range slope adjust variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts linearity of range sweep.	
	Range zero set variable resistor	R7	Rotary with lock (screw-driver adjust)	Adjusted to center range sweep.	

Table 64 (U). Target Radar Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
	Write pulse adjust variable resistor	R46	Rotary with lock (screw-driver adjust)	Adjusted to correct trailing edge position of target track antenna circle.	5, fig. 76
B scope modulation eliminator	NORMAL—LIMIT—OFF switch	S3	Toggle (two-position)	When set to LIMIT, limits the sweep output voltage to ±10 volts. When set to OFF, allows a true measurement of the sweep output voltage at SWP test point TP1.	
	POS—ZERO switch	S2	Toggle (two-position)	Removes TTR azimuth position input to B scope in zero position. Normal position is POS.	
	SWP AMP variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts amplitude of acquisition azimuth input in zero position. Normal position is SWP.	
	SWP—ZERO switch	S1	Toggle (two-position)	Removes acquisition azimuth input to the B scope in zero position. Normal position is SWP.	
B scope sweep amplifier	DC BAL variable resistor	R4	Rotary with lock (screw-driver adjust)	Adjusts level of sweep amplifier output.	
	GAIN SET variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts gain of sweep amplifier.	
	Phase tuning variable capacitor	C17	Rotary (screw-driver adjust)	Adjusts symmetry of circle.	
	ZERO SET variable resistor	R29	Rotary with lock (screw-driver adjust)	Adjusted to balance sweep amplifier.	
B scope sweep generator	Azimuth zero set variable resistor	R24	Rotary with lock (screw-driver adjust)	Adjusted to center azimuth sweep.	
	Range slope adjust variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts linearity of range sweep.	
	Range zero set variable resistor	R7	Rotary with lock (screw-driver adjust)	Adjusted to center range sweep.	

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Table 64 (U). Target Radar Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
B scope indicator—Continued					
B scope video amplifier	PED ADJ variable resistor	R42	Rotary with lock (screwdriver adjust)	Adjusts for equal intensity throughout B scope display.	
	RANGE ADJ variable resistor	R17	Rotary with lock (screwdriver adjust)	Adjusts duration of the gate sweep.	
	SYMBOL INT ADJ variable resistor	R25	Rotary with lock (screwdriver adjust)	Adjusts intensity of marks and symbols on B scope.	
Countermeasures control-indicator	ASTIGMATISM variable resistor	R12	Rotary (knob adjust)	Corrects astigmatism in the countermeasures control-indicator presentation.	
Countermeasures range sweep generator	HOR CENT variable resistor	R13	Rotary with lock (screwdriver adjust)	Adjusted to center the sweep horizontally.	
	MAX SWP RG variable resistor	R9	Rotary with lock (screwdriver adjust)	Adjusts maximum range of sweep.	
	PAN TIMING 2.3MSEC variable resistor	R41	Rotary with lock (screwdriver adjust)	Adjusts time between panoramic sweeps.	
	PAN TIMING 9.2MSEC variable resistor	R39	Rotary with lock (screwdriver adjust)	Adjusts panoramic sweep timing.	
	SWP LG variable resistor	R31	Rotary with lock (screwdriver adjust)	Adjusts length of sweep.	
Countermeasures video amplifier	PAN VERT CENT variable resistor	R27	Rotary with lock (screwdriver adjust)	Adjusted to center panoramic sweep vertically.	
	PAN VIDEO GAIN variable resistor	R25	Rotary with lock (screwdriver adjust)	Adjusts amplitude of panoramic video.	
	RG VERT CENT variable resistor	R10	Rotary with lock (screwdriver adjust)	Adjusted to center range sweep vertically.	
	RG VIDEO GAIN variable resistor	R8	Rotary with lock (screwdriver adjust)	Adjusts amplitude of range video.	
Panoramic sweep generator	HOR CENT variable resistor	R15	Rotary with lock (screwdriver adjust)	Adjusted to center panoramic sweep horizontally.	
	IND SWP LG variable resistor	R6	Rotary with lock (screwdriver adjust)	Adjusts length of panoramic sweep.	
	PAN LINEARITY variable resistor	R23	Rotary with lock (screwdriver adjust)	Adjusts linearity of panoramic sweep.	
	PAN SWP AMP variable resistor	R24	Rotary with lock (screwdriver adjust)	Adjusts amplitude of panoramic sweep and determines width of band through which pan local oscillator sweeps.	
	PED AMP variable resistor	R60	Rotary with lock (screwdriver adjust)	Adjusts the pedestal amplitude on sweep.	

Table 64 (U). Target Radar Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Panoramic sweep generator—Continued	PED L EDGE ADJ variable resistor	R47	Rotary with lock (screwdriver adjust)	Adjusts position of pedestal left edge.	
	PED POS (HIGH) variable resistor	R31	Rotary with lock (screwdriver adjust)	Adjusts pedestal position at high frequency.	
	PED POS (LOW) variable resistor	R34	Rotary with lock (screwdriver adjust)	Adjusts length of panoramic sweep.	
	PED R EDGE ADJ variable resistor	R44	Rotary with lock (screwdriver adjust)	Adjusts position of pedestal right edge.	
IF preamplifier	GAIN ADJ variable resistor	R26	Rotary with lock (screwdriver adjust)	Adjusts noise level on TTR lin-log presentation.	
Lin-log amplifier	VID GAIN ADJ variable resistor	R52	Rotary with lock (screwdriver adjust)	Adjusts amplitude of TTR lin-log video.	
Mark generator	4KC ADJ variable resistor	R20	Rotary with lock (screwdriver adjust)	Adjusts the 4-kc signal at TP1, to minimize and maximize once per antenna revolution.	
	GATE ADJ variable resistor	R10	Rotary with lock (screwdriver adjust)	Adjusted for one track azimuth line per antenna revolution.	
	Test point	TP1		Monitors the 4-kc signal.	fig. 76.1
Range error detector	RANGE BAL 2 SP variable resistor	R81	Rotary with lock (screwdriver adjust)	Adjusts for balance in cathode circuit of short pulse coincidence detector.	
	RANGE BAL 2 TTR LP variable resistor	R35	Rotary with lock (screwdriver adjust)	Adjusts for balance in cathode circuit of long pulse coincidence detector with RANGE TRACK switch in TTR.	
	RANGE BAL 2 TRR LP variable resistor	R41	Rotary with lock (screwdriver adjust)	Adjusts for balance in plate circuit of long pulse coincidence detector with RANGE TRACK switch in TRR.	
	RANGE BAL 3 variable resistor	R93	Rotary with lock (screwdriver adjust)	Adjusts for balanced error output when TEST—OPERATE switch is set to TEST.	
	TEST—OPERATE switch	S1	Toggle (two-position)	When set to TEST, allows balancing of output of range error detector during automatic range operation.	
Range gate generator	500 YD EXP variable resistor	R8	Rotary with lock (screwdriver adjust)	Adjusts width of the expanded area.	
	LP SWP CENTERING (AZ & EL IND) variable resistor	R85	Rotary with lock (screwdriver adjust)	Adjusts centering of notch in LP operation on the azimuth and elevation indicators.	
	LP SWP CENTERING (RG) variable resistor	R70	Rotary with lock (screwdriver adjust)	Adjusts centering of notch in LP operation on the range indicator.	
	MV BIAS variable resistor	R6	Rotary with lock (screwdriver adjust)	Adjusts sensitivity of V1A.	

Table 64 (U). Target Radar Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target antenna control group	AZ TACH ADJ variable resistor	R14	Rotary with lock (screw-driver adjust)	Adjusts phase of feedback in azimuth channel.	
	Azimuth balance variable resistor	R27	Rotary with lock (screw-driver adjust)	Balances input of azimuth hand-wheel drive control.	
	Range balance variable resistor	R23	Rotary with lock (screw-driver adjust)	Balances input of range hand-wheel drive control.	
Acquire aid amplifier	DRIFT variable resistor	R1	Rotary with lock (screw-driver adjust)	Balances out any extraneous inputs to the amplifier.	
Azimuth intermediate drive control	PHASE variable resistor	R3	Rotary with lock (screw-driver adjust)	Adjusts amplitude of azimuth intermediate drive control tachometer feedback voltage.	
Elevation intermediate drive control	PHASE variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts amplitude of elevation intermediate drive control tachometer feedback voltage.	
Handwheel drive control (3)	BAL variable resistor	R4	Rotary with lock (screw-driver adjust)	Balances output of handwheel drive control for zero output with MAN—AID—AUTO switch set to MAN.	
	PHASE variable resistor	R2	Rotary with lock (screw-driver adjust)	Adjusts for 180-degree phase angle between motor and generator excitation and output.	
	Rate variable resistor	R3	Rotary with lock (screw-driver adjust)	Balances output of handwheel drive control for zero output with MAN—AID—AUTO switch set to AID. *Note.* It is necessary to loosen allen-head screw (1, fig. 77) to adjust rate variable resistor R3.	2, fig. 77
Target azimuth coupling resistor assembly	AZIMUTH—AID variable resistor	R2	Rotary with lock (screw-driver adjust)	Adjusts azimuth aided tracking rate.	
	AZIMUTH—AUTO variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts azimuth automatic tracking rate.	
	AZIMUTH—PRE. AMP BAL switch	S1	Pushbutton	When depressed, removes input to pre amplifier.	
Target elevation coupling resistor assembly	ELEVATION—AID variable resistor	R2	Rotary with lock (screw-driver adjust)	Adjusts elevation aided tracking rate.	
	ELEVATION—AUTO variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts elevation automatic tracking rate.	
	ELEVATION—PRE. AMP BAL switch	S1	Pushbutton	When depressed, removes input to pre amplifier.	
Target range coupling resistor assembly	Range AID variable resistor	R2	Rotary with lock (screw-driver adjust)	Adjusts range aided tracking rate.	
	Range AUTO variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts range automatic tracking rate.	
	RANGE variable resistor	R3	Rotary with lock (screw-driver adjust)	Adjusts target track range rate to the designated acquisition aided range rate.	

Table 64 (U). Target Radar Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target radar control cabinet	TEST IND switch	S23	Toggle (two-position)	Switches the video on the target range indicator from normal video to test video.	
Target track control-power supply	HIPAR LONG PULSE variable resistor	R15	Rotary with lock (screw-driver adjust)	Adjusts magnetron current in long pulse mode when HIPAR operation is selected.	
	HIPAR SHORT PULSE variable resistor	R14	Rotary with lock (screw-driver adjust)	Adjusts magnetron current in short pulse mode when HIPAR operation is selected.	
	INCREASE—DECREASE variable transformer	T4	Rotary with lock (screw-driver adjust)	Adjusts the ratio of current drawn by the magnetron in the LONG PULSE and SHORT PULSE modes. Adjustment is made in the SHORT PULSE mode.	
	Transformer T3 stop controls (3)	T3	Screw (3)	Allow positioning of HV power supply stops.	78
Test adapter	ATTENUATOR VOLTAGE switch	S1	Rotary (four-position)	Attenuates input used when measuring large amplitude voltages.	
	GAIN variable resistor	R10	Rotary (knob adjust)	Adjusts gain of test amplifier.	
	MEAS—CAL switch	S3	Toggle (two-position)	Selects one of two inputs to the test amplifier: calibration voltage, or input to be measured.	
	AMP CAL ON—AMP ON—OFF switch	S2	Toggle (three-position)	Selects one of three conditions for the test amplifier: AMP CAL ON for calibration, AMP ON for measuring, and OFF.	

103 (C). Radar Set Group

The controls and indicators of the radar set group (5, fig. 28) are located on the error voltage monitors, target test IF signal generator, launcher position controls, error pulse converters, track IF amplifiers, range error converter, angle error detectors, range calibrator generator, range modulator amplifiers, receiver gate generator, track range amplifier-control group, target range mark generator, target range amplifier-control groups, target timing wave amplifier-oscillator, range mark generator, track band pass filter, AGC, IF signal divider, and timing wave amplifier-oscillators. The nonplacarded controls and indicators are shown on figures 79 and 80, and all controls and indicators are described in alphabetical order in table 65.

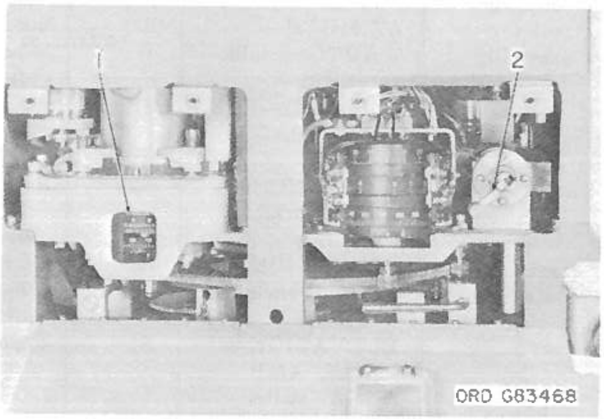


Figure 79 (C). Target range amplifier-control group—access door open (U).

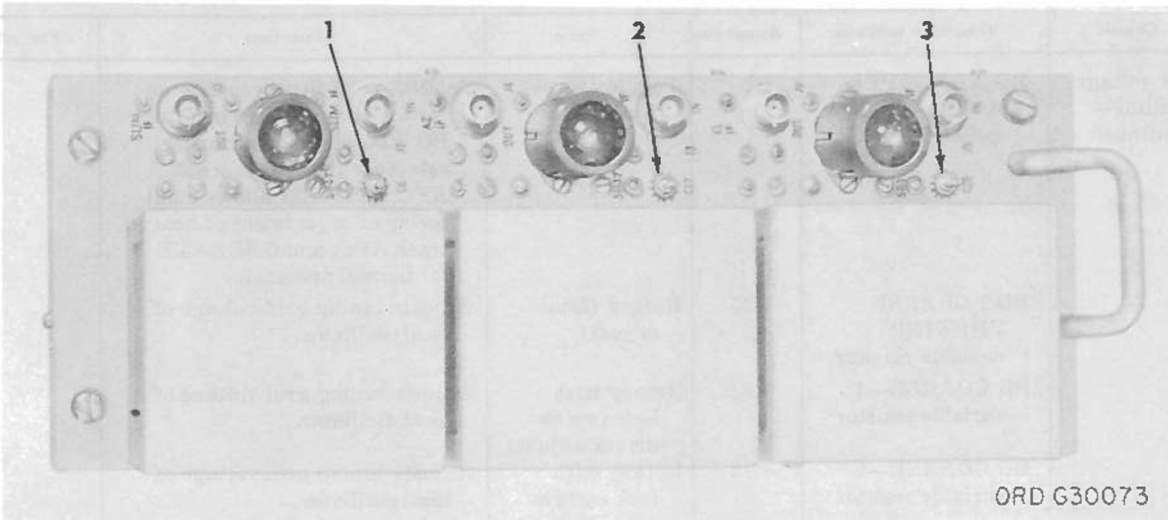


Figure 80 (U). Track band pass filter—nonplacarded controls (U).

Table 65 (U). Radar Set Group—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
AGC (2)	PRE-ATTEN variable resistor	R59	Rotary with lock (screw-driver adjust)	Adjusts the AGC level at which the three IF attenuators are coupled into the receiver circuit.	
Angle error detector (4)	MOD. BAL vari-able resistor	R37	Rotary with lock (screw-driver adjust)	Balances output with no error input. (Applicable to TTR only.)	
Error pulse converter (2)	AZ BAL variable resistor	R8	Rotary with lock (screw-driver adjust)	Balances output of azimuth channel with zero input.	
	EL BAL variable resistor	R19	Rotary with lock (screw-driver adjust)	Balances output of elevation channel with zero input.	
Error voltage monitor (2)	AFC ADJ variable resistor	R36	Rotary with lock (screw-driver adjust)	Adjusts zero of beacon track AFC.	
	AGC ADJ variable resistor	R29	Rotary with lock (screw-driver adjust)	Adjusts AGC voltage level.	
	ANGLE ERROR AZ meter	M3		Indicates output of azimuth angle error detector.	
	ANGLE ERROR EL meter	M2		Indicates output of elevation angle error detector.	
	AZ GAIN vari-able resistor	R26	Rotary with lock (screw-driver adjust)	Sets reference level of ANGLE ERROR AZ meter.	
	Azimuth meter SENSITIVITY switch	S7	Toggle (two-posi-tion, spring-loaded to right)	Changes sensitivity of ANGLE ERROR AZ meter.	
	BEACON—TAR-GET switch	S4	Toggle (two-position)	Selects either missile or target mode of operation.	

Table 65 (U). Radar Set Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Error voltage monitor—Continued	BO ADJ—OPERATE AFC ADJ switch	S9	Toggle (three-position)	Selects one of three conditions for the error voltage monitor: BO ADJ allows monitoring reference for beacon track AFC, AFC ADJ allows monitoring of adjustment of beacon track AFC, and OPERATE for normal operation.	
	BO 1 COARSE VERNIER variable resistor	R35	Rotary (knob adjust)	Adjusts tuning grid voltage of local oscillator.	
	BO COARSE—1 variable resistor	R9	Rotary with lock (screw-driver adjust)	Adjusts tuning grid voltage of local oscillator.	
	BO COARSE—2 variable resistor	R12	Rotary with lock (screw-driver adjust)	Adjusts tuning grid voltage of local oscillator.	
	BO COARSE—3 variable resistor	R13	Rotary with lock (screw-driver adjust)	Adjusts tuning grid voltage of local oscillator.	
	BO FINE—1 variable resistor	R19	Rotary with lock (screw-driver adjust)	Adjusts repeller voltage of local oscillator.	
	BO FINE—2 variable resistor	R20	Rotary with lock (screw-driver adjust)	Adjusts repeller voltage of local oscillator.	
	BO FINE—3 variable resistor	R21	Rotary with lock (screw-driver adjust)	Adjusts repeller voltage of local oscillator.	
	BO SWEEP switch	S8	Toggle (two-position, spring-loaded to left)	Applies search voltage to beacon track AFC.	
	Elevation meter SENSITIVITY switch	S6	Toggle (two-position, spring-loaded to left)	Changes sensitivity of ANGLE ERROR EL meter.	
	EL GAIN variable resistor	R27	Rotary with lock (screw-driver adjust)	Sets reference level of ANGLE ERROR EL meter.	
	GAIN CONT switch	S5	Toggle (two-position, spring-loaded to left)	Switches from AGC to manual gain control.	
	MANUAL GAIN variable resistor	R3	Rotary (knob adjust)	Controls gain manually when GAIN CONT switch is operated.	
	MISSILE FREQ switch	S2	Rotary (three-position)	Selects any one of three frequencies (determined by adjustment of BO FINE—1, BO COARSE—1, BO FINE—2, BO COARSE—2, BO FINE—3, BO COARSE—3).	
	MONITOR switch	S3	Rotary (three-position)	Switches monitoring circuit to elevation, azimuth, or sum channel.	
	MTR—TTR switch	S10	Toggle (two-position)	Changes voltage range of local oscillator.	

Table 65 (U). Radar Set Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Error voltage monitor—Continued	RCVR TEST meter	M1		Indicates AFC crystal current, IF amplifier bias, and beacon track AFC voltage depending upon the position of RCVR TEST switch S1.	
	RCVR TEST switch	S1	Rotary (three-position)	Selects the three functions of RCVR TEST meter.	
IF signal divider	IF GAIN ADJ variable resistor	R6	Rotary with lock (screw-driver adjust)	Equalizes the amplitude of AGC and lin-log video.	
Launcher position control (17)	AZIMUTH—100 MILS	B2	Rotary	Adjusts azimuth positioning voltage to applicable launcher or flight simulator group.	
	ELEVATION—100 MILS	B1	Rotary	Adjusts elevation positioning voltage to applicable launcher or flight simulator group.	
	RANGE—10 YARDS variable resistor	R1	Rotary (knob adjust)	Adjusts range positioning voltage to applicable launcher or flight simulator group.	
Range error converter	500 YD EXP variable resistor	R9	Rotary with lock (screw-driver adjust)	Adjusts width (yards) of expanded sweep.	
	ATC BAL 3 NIKE B variable resistor	R115	Rotary with lock (screw-driver adjust)	Adjusts sensitivity of NIKE-HERCULES ATC amplifier.	
	ATC BAL 3 NIKE I variable resistor	R114	Rotary with lock (screw-driver adjust)	Adjusts sensitivity of NIKE-AJAX ATC amplifier.	
	MV BIAS variable resistor	R4	Rotary with lock (screw-driver adjust)	Adjusts operating level of multivibrator for 500-yard expanded sweep.	
	NOTCH AM variable resistor	R94	Rotary with lock (screw-driver adjust)	Adjusts range notch amplitude.	
	RANGE BAL 2 NIKE B variable resistor	R106	Rotary with lock (screw-driver adjust)	Balances coincidence circuit for zero output with only noise input for NIKE-HERCULES.	
	RANGE BAL 2 NIKE I variable resistor	R51	Rotary with lock (screw-driver adjust)	Balances coincidence circuit for zero output with only noise input for NIKE-AJAX.	
	RANGE BAL 3 variable resistor	R65	Rotary with lock (screw-driver adjust)	Balances error voltage outputs.	
	TEST—OPR switch	S1	Toggle (two-position)	When in TEST position, allows balancing of output of range error converter during automatic range operation.	
Range calibrator generator	MISSILE ERROR meter	M1		Monitors range error of MTR system.	
	MISSILE PHASE variable resistor	R52	Rotary (knob adjust)	Adjusts time relationship between the 500-yard marks and the sync pulse for the missile range system.	
	OFF—METERS switch	S8	Toggle (two-position)	Switches MISSILE ERROR and TARGET ERROR meters into, or removes meters from, range error metering circuit.	

Table 65 (U). Radar Set Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Range calibrator generator—Continued	TARGET ERROR meter	M2		Monitors range error of TTR and TRR systems.	
	TARGET PHASE variable resistor	R53	Rotary (knob adjust)	Adjusts time relationship between the 500-yard marks and the sync pulse for the target range system.	
Range modulator amplifier	LONG BAL variable resistor	R16	Rotary with lock (screwdriver adjust)	Adjusts operational level of missile range modulator amplifier.	
	TRANS BAL variable resistor	R19	Rotary with lock (screwdriver adjust)	Adjusts to drift in MTR range system servo loop during automatic mode of operation.	
Range modulator amplifier	LONG BAL variable resistor	R16	Rotary with lock (screwdriver adjust)	Adjusts operational level of target track range modulator amplifier.	
	TRANS BAL variable resistor	R19	Rotary with lock (screwdriver adjust)	Adjusts to drift in TTR range system servo loop during automatic mode of operation.	
Receiver gate generator	500 YD GATE variable resistor	R7	Rotary with lock (screwdriver adjust)	Adjusts width of 500-yard receiver gate.	
	LP NOTCH AM variable resistor	R82	Rotary with lock (screwdriver adjust)	Adjusts amplitude of notch during the long pulse mode.	
	MV BIAS variable resistor	R3	Rotary with lock (screwdriver adjust)	Adjusts sensitivity of V1A.	
	SP NOTCH AM variable resistor	R101	Rotary with lock (screwdriver adjust)	Adjusts amplitude of notch during the short pulse mode.	
	TRR VID AM variable resistor	R106	Rotary with lock (screwdriver adjust)	Adjusts amplitude of TRR video.	
	DELAY ADJUST switch	S1	Rotary switch assembly (screwdriver adjust)	Adjusts delay in AGC channel to match the delay in the lin-log channel.	
Target range amplifier-control group (2)	Manual crank			Positions range dial during test conditions.	2, fig. 79
Target range position transmitter	Phase-shift capacitor dial			Indicates position of phase-shift capacitor.	1, fig. 79
Target timing wave amplifier-oscillator	RANGE ZERO ADJ screw		Mechanical	Adjusts phasing capacitor for range zero.	
Target range mark generator	A TRIG ADJ variable resistor	R65	Rotary with lock (screwdriver adjust)	Adjusted to provide smooth transition during A/R switching.	
	FIL BAL variable resistor	R3	Rotary with lock (screwdriver adjust)	Adjusted to balance filament circuit to reduce 400-cycle hum.	

Table 65 (U). Radar Set Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Target range mark generator—Continued	R TRIG SLOPE variable resistor	R75	Rotary with lock (screw-driver adjust)	Adjusted to keep pip centered in the R sweep trigger select gate from 20,000 to 200,000 yards during R presentation.	
	R TRIG ZERO variable resistor	R60	Rotary with lock (screw-driver adjust)	Adjusted to select proper pip from target timing wave amplifier-oscillator for R presentation.	
	RANGE GATE variable resistor	R107	Rotary with lock (screw-driver adjust)	Adjusts width of 5,000-yard gate.	
	RANGE SLOPE variable resistor	R38	Rotary with lock (screw-driver adjust)	Adjusted to center pip in range select gate throughout range.	
	RANGE ZERO variable resistor	R58	Rotary with lock (screw-driver adjust)	Adjusts to select proper pip from target timing wave amplifier-oscillator.	

Table 65 (U). Radar Set Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target test IF signal generator	DELAY ADJUST knob	R3	Rotary (vernier knob adjust)	Adjusts time delay between sync pulse and 60-mc output pulse.	
	LONG PULSE—SHORT PULSE switch	S1	Toggle (two-position)	Selects long or short pulse test signal output.	
	OSC FREQ ADJUST variable capacitor	C16	Rotary (knob adjust)	Adjusts frequency of 60-mc oscillator.	
	OUTPUT ATTEN. coarse switch	AT1-B	Rotary (six-position)	Attenuates output from 0 db through 50 db in increments of 10 db.	
	OUTPUT ATTEN, fine switch	AT1-A	Rotary (ten-position)	Attenuates output from 0 db through 9 db in increments of 1 db.	
	OUTPUT ATTEN. switch	S2	Toggle (two-position)	When set to 20, attenuates output 20 db.	
Track band pass filter	Azimuth variable capacitor	C17	Rotary	Determines phase of azimuth channel.	2, fig. 80
	Elevation variable capacitor	C28	Rotary	Determines phase of elevation channel.	3, fig. 80
	Sum variable capacitor	C6	Rotary	Determines phase of sum channel.	1, fig. 80
Track IF amplifier (6)	PH ADJ variable capacitor	C40	Rotary	Adjusts phase of sum, azimuth, and elevation channels.	
	GAIN TRIM variable resistor	R37	Rotary	Equalizes the gain of sum, azimuth, and elevation channels.	
Track range amplifier-control group					
Range mark generator	FIL BAL variable resistor	R105	Rotary with lock (screwdriver adjust)	Balances filament circuit to reduce 400-cycle hum.	
	RANGE GATE variable resistor	R79	Rotary with lock (screwdriver adjust)	Adjusts 5,000-yard gate width.	
	SLOPE variable resistor	R48	Rotary with lock (screwdriver adjust)	Adjusted to center pip in notch throughout range.	
	ZERO variable resistor	R40	Rotary with lock (screwdriver adjust)	Adjusted to select proper pip from timing wave amplifier-oscillator.	
Range position transmitter					
Timing wave amplifier-oscillator (2)	FREQ ADJ variable capacitor	C6	Rotary	Adjusts frequency of 82-kc oscillator.	
	MAIN GATE NIKE B variable resistor	R6	Rotary with lock (screwdriver adjust)	Adjusts length of main range gate in NIKE-HERCULES mode of operation.	
	MAIN GATE NIKE I variable resistor	R34	Rotary with lock (screwdriver adjust)	Adjusts length of main range gate in NIKE-AJAX mode of operation.	

104 (U). Missile Radar Control Console

The controls and indicators for the missile radar control console (3, fig. 28) are located on the missile radar control console, command oscilloscope, frequency divider generator, pulse generator, frequency generator, test adapter, pulse repetition generator, combining amplifier, burst generator, pitch generator, yaw generator, AGC monitor amplifier, angle modulator amplifier, elevation intermediate drive control, handwheel drive controls, missile track slew control amplifier, range indicator, range track video amplifier, track sweep generator, missile track control power supply, missile azimuth coupling resistor assembly, missile elevation coupling resistor assembly, and missile range coupling resistor assembly. The nonplacarded controls and indicators are shown in figures 77, 78, and 81 and all controls and indicators are described in alphabetical order in table 66.

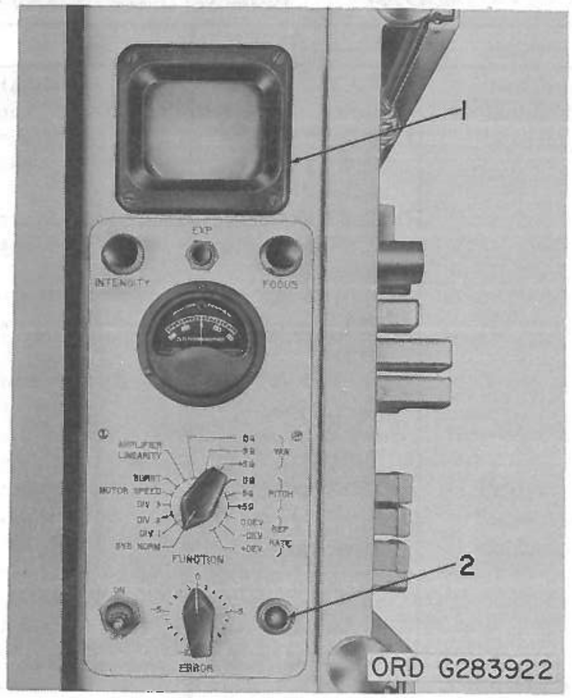


Figure 81 (C). Command oscilloscope—front view—nonplacarded indicators (U).

Table 66 (U). Missile Radar Control Console—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Missile radar control console	VIDEO switch	S19	Toggle (two-position)	Switches the video on the range indicator from normal video to test video.	
Burst generator	BURST FREQ variable resistor	R3	Rotary with lock (screw-driver adjust)	Adjusts frequency of burst generator.	
Combining amplifier	BURST variable resistor	R9	Rotary with lock (screw-driver adjust)	Adjusts amplitude of burst command input.	
	PITCH variable resistor	R8	Rotary with lock (screw-driver adjust)	Adjusts amplitude of pitch command input.	
	YAW variable resistor	R7	Rotary with lock (screw-driver adjust)	Adjusts amplitude of yaw command input.	
Command oscilloscope	Cathode-ray tube	V2	Oscilloscope	Indicates visually commands in the NIKE-AJAX mode of operation.	1, fig. 81
	ERROR variable resistor	R3	Rotary (knob adjust)	Adjusted for allowable tolerance for +5G YAW, +5G PITCH, and +DEV—REP RATE.	
	EXP switch	S3	Pushbutton	Expands sweep of oscilloscope.	
	FOCUS variable resistor	R19	Rotary (knob adjust)	Adjusts focus of oscilloscope.	
	FUNCTION meter	M1		Indicates amplitude of commands for NIKE-AJAX mode of operation.	

Table 65 (U). Radar Set Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target test IF signal generator	DELAY ADJUST knob	R3	Rotary (vernier knob adjust)	Adjusts time delay between sync pulse and 60-mc output pulse.	
	LONG PULSE—SHORT PULSE switch	S1	Toggle (two-position)	Selects long or short pulse test signal output.	
	OSC FREQ ADJUST variable capacitor	C16	Rotary (knob adjust)	Adjusts frequency of 60-mc oscillator.	
	OUTPUT ATTEN. coarse switch	AT1-B	Rotary (six-position)	Attenuates output from 0 db through 50 db in increments of 10 db.	
	OUTPUT ATTEN, fine switch	AT1-A	Rotary (ten-position)	Attenuates output from 0 db through 9 db in increments of 1 db.	
	OUTPUT ATTEN. switch	S2	Toggle (two-position)	When set to 20, attenuates output 20 db.	
Track band pass filter	Azimuth variable capacitor	C17	Rotary	Determines phase of azimuth channel.	2, fig. 80
	Elevation variable capacitor	C28	Rotary	Determines phase of elevation channel.	3, fig. 80
	Sum variable capacitor	C6	Rotary	Determines phase of sum channel.	1, fig. 80
Track IF amplifier (6)	PH ADJ variable capacitor	C40	Rotary	Adjusts phase of sum, azimuth, and elevation channels.	
Track range amplifier-control group					
Range mark generator	FIL BAL variable resistor	R105	Rotary with lock (screwdriver adjust)	Balances filament circuit to reduce 400-cycle hum.	
	RANGE GATE variable resistor	R79	Rotary with lock (screwdriver adjust)	Adjusts 5,000-yard gate width.	
	SLOPE variable resistor	R48	Rotary with lock (screwdriver adjust)	Adjusted to center pip in notch throughout range.	
	ZERO variable resistor	R40	Rotary with lock (screwdriver adjust)	Adjusted to select proper pip from timing wave amplifier-oscillator.	
Range position transmitter					
Timing wave amplifier-oscillator (2)	FREQ ADJ variable capacitor	C6	Rotary	Adjusts frequency of 82-kc oscillator.	
	MAIN GATE NIKE B variable resistor	R6	Rotary with lock (screwdriver adjust)	Adjusts length of main range gate in NIKE-HERCULES mode of operation.	
	MAIN GATE NIKE I variable resistor	R34	Rotary with lock (screwdriver adjust)	Adjusts length of main range gate in NIKE-AJAX mode of operation.	

104 (U). Missile Radar Control Console

The controls and indicators for the missile radar control console (3, fig. 28) are located on the missile radar control console, command oscilloscope, frequency divider generator, pulse generator, frequency generator, test adapter, pulse repetition generator, combining amplifier, burst generator, pitch generator, yaw generator, AGC monitor amplifier, angle modulator amplifier, elevation intermediate drive control, handwheel drive controls, missile track slew control amplifier, range indicator, range track video amplifier, track sweep generator, missile track control power supply, missile azimuth coupling resistor assembly, missile elevation coupling resistor assembly, and missile range coupling resistor assembly. The nonplacarded controls and indicators are shown in figures 77, 78, and 81 and all controls and indicators are described in alphabetical order in table 66.

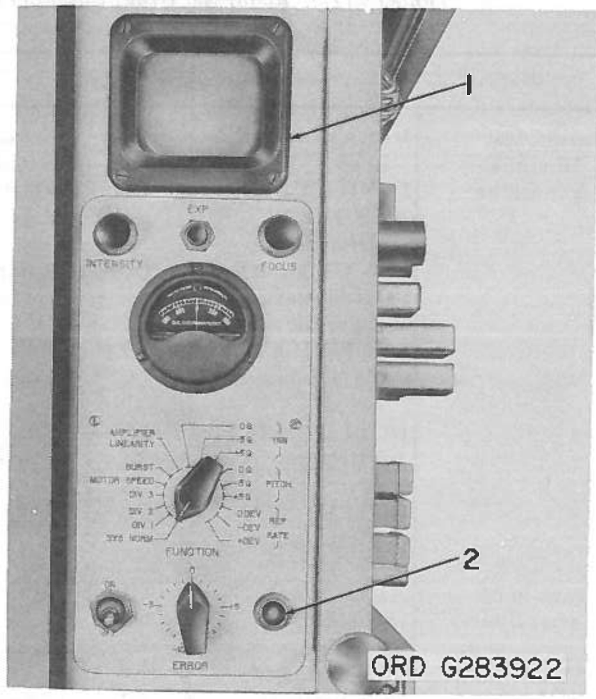


Figure 81 (C). Command oscilloscope—front view—nonplacarded indicators (U).

Table 66 (U). Missile Radar Control Console—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Missile radar control console	VIDEO switch	S19	Toggle (two-position)	Switches the video on the range indicator from normal video to test video.	
Burst generator	BURST FREQ variable resistor	R3	Rotary with lock (screwdriver adjust)	Adjusts frequency of burst generator.	
Combining amplifier	BURST variable resistor	R9	Rotary with lock (screwdriver adjust)	Adjusts amplitude of burst command input.	
	PITCH variable resistor	R8	Rotary with lock (screwdriver adjust)	Adjusts amplitude of pitch command input.	
	YAW variable resistor	R7	Rotary with lock (screwdriver adjust)	Adjusts amplitude of yaw command input.	
Command oscilloscope	Cathode-ray tube	V2	Oscilloscope	Indicates visually commands in the NIKE-AJAX mode of operation.	1, fig. 81
	ERROR variable resistor	R3	Rotary (knob adjust)	Adjusted for allowable tolerance for +5G YAW, +5G PITCH, and +DEV—REP RATE.	
	EXP switch	S3	Pushbutton	Expands sweep of oscilloscope.	
	FOCUS variable resistor	R19	Rotary (knob adjust)	Adjusts focus of oscilloscope.	
	FUNCTION meter	M1		Indicates amplitude of commands for NIKE-AJAX mode of operation.	

Table 66 (U). Missile Radar Control Console—Behind Panel Controls and Indicators—Continued (*U*)

Chassis	Control of indicator	Appar des	Type	Function	Fig. ref
Missile radar control console—Continued					
Command oscilloscope —Continued	FUNCTION switch	S1	Rotary (16-position)	Select functions to present on oscilloscope for calibration purposes.	
	HOR. CTR variable resistor	R72	Rotary with lock (screw-driver adjust)	Adjusts horizontal centering of oscilloscope sweep.	
	HOR GAIN variable resistor	R40	Rotary with lock (screw-driver adjust)	Adjusts horizontal gain of oscilloscope.	
	INTENSITY variable resistor	R18	Rotary (knob adjust)	Adjusts brightness of oscilloscope presentation.	
	Power indicator light	I1	Green	Illuminates when power is applied to command oscilloscope.	2, fig. 81
	ON-OFF switch	S2	Toggle (two-position)	When set to ON applies power to command oscilloscope.	
	VERT. CTR variable resistor	R71	Rotary with lock (screw-driver adjust)	Adjusts vertical centering of oscilloscope sweep.	
	VERT. GAIN variable resistor	R14	Rotary with lock (screw-driver adjust)	Adjusts vertical amplitude of oscilloscope display.	
	ZERO variable resistor	R36	Rotary with lock (screw-driver adjust)	Zeros the FUNCTION meter.	
Frequency divider generator	DIV 1 variable resistor	R18	Rotary with lock (screw-driver adjust)	Adjusts frequency of the output of first frequency divider.	
	DIV 2 variable resistor	R28	Rotary with lock (screw-driver adjust)	Adjusts frequency of the output of second frequency divider.	
Frequency generator	DIV 3 variable resistor	R3	Rotary with lock (screw-driver adjust)	Adjusts frequency of the frequency generator.	
Missile control-indicator group					
AGC monitor amplifier	ATC ADJ variable resistor	R14	Rotary with lock (screw-driver adjust)	Adjusts the operating point for ATC action.	
	Indicator light	DS1	White	Illuminates when AGC voltage drops below level set by LEVEL SET variable resistor.	
	LEVEL SET 1 variable resistor	R4	Rotary with lock (screw-driver adjust)	Adjusts AGC signal level for operation of the AGC monitor amplifier after missile acquire has been accomplished.	
	LEVEL SET 2 variable resistor	R20	Rotary with lock (screwdriver adjust)	Adjusts AGC signal level for operation of the AGC monitor amplifier during the missile acquire phase.	
Angle modulator amplifier	BAL variable resistor	R14	Rotary with lock (screw-driver adjust)	Balances input modulation tubes for balanced output.	

Table 66 (U). Missile Radar Control Console—Behind Panel Controls and Indicators—Continued (*U*)

Chassis	Control of indicator	Appar des	Type	Function	Fig. ref
Missile radar control console—Continued					
Missile control-indicator group—Continued					
Angle modulator amplifier—Continued	PHASE variable resistor	R30	Rotary with lock (screw-driver adjust)	Determines phase of output with respect to the reference voltage.	
Missile track slew control amplifier	BAL 1 variable resistor	R17	Rotary with lock (screw-driver adjust)	Balances outputs so they are equal in amplitude and opposite in polarity.	
	BAL 2 variable resistor	R18	Rotary with lock (screw-driver adjust)	Balances output to zero with input removed.	
	PRE-ATTEN switch	S1	Pushbutton	Disables the pre-attenuators in the receiver so that the AGC voltage can be set up properly (level set).	
Missile track control drawer					
Azimuth intermediate drive control	PHASE variable resistor	R3	Rotary with lock (screw-driver adjust)	Adjusts amplitude of azimuth intermediate drive control tachometer feedback voltage.	
Elevation intermediate drive control	PHASE variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts amplitude of elevation intermediate drive control tachometer feedback voltage.	
Handwheel drive control (3)	BAL variable resistor	R4	Rotary with lock (screw-driver adjust)	Balances output of handwheel drive control for zero output with MAN—AID—AUTO switch set to MAN.	
	PHASE variable resistor	R2	Rotary with lock (screw-driver adjust)	Adjusts for 180-degree phase angle between motor and generator excitation and output.	
	Rate variable resistor	R3	Rotary with lock (screw-driver adjust)	Balances output of handwheel drive control for zero output with MAN—AID—AUTO switch set to AID. *Note.* It is necessary to loosen allen-head screw (1, fig. 77) to adjust rate variable resistor R3.	2, fig. 77
Missile azimuth coupling resistor assembly	AZIMUTH—AID variable resistor	R2	Rotary with lock (screw-driver adjust)	Adjusts azimuth aided tracking rate.	
	AZIMUTH—AUTO variable resistor	R1	Rotary with lock (screw-driver adjust)	Adjusts azimuth automatic tracking rate.	
	AZIMUTH—PRE. AMP BAL switch	S1	Pushbutton	Removes input to pre amplifier.	

*Table 66 (U). Missile Radar Control Console—Behind Panel Controls and Indicators—*Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Missile radar control console—Continued Missile track control drawer—Continued					
Missile elevation coupling resistor assembly	ELEVATION—AID variable resistor	R2	Rotary with lock (screwdriver adjust)	Adjusts elevation aided tracking rate.	
	ELEVATION—AUTO variable resistor	R1	Rotary with lock (screwdriver adjust)	Adjusts elevation automatic tracking rate.	
	ELEVATION—PRE. AMP BAL switch	S1	Pushbutton	Removes input to pre amplifier.	
Missile range coupling resistor assembly	RANGE—AID variable resistor	R2	Rotary with lock (screwdriver adjust)	Adjusts range aided tracking rate.	
	RANGE—AUTO variable resistor	R1	Rotary with lock (screwdriver adjust)	Adjusts range automatic tracking rate.	
Missile track control power supply	INCREASE—DECREASE variable transformer	T4	Rotary with lock (screwdriver adjust)	Adjusts magnetron current in B mode of operation.	
	METER ADJ SLEW variable resistor	R15	Rotary with lock (screwdriver adjust)	Adjusted to prevent an off-scale indication on FREQUENCY meter M2 when magnetron is off frequency.	
	METER ADJ TUNE variable resistor	R17	Rotary with lock (screwdriver adjust)	Adjusted for proper FREQUENCY meter indication when magnetron is at proper frequency.	
	OVERRIDE switch	S9	Toggle (two-position)	Simulates an on-frequency condition and overrides K7.	
	RELAY ADJUST TUNE variable resistor	R22	Rotary with lock (screwdriver adjust)	Determines the energizing point of relay K7.	
	Transformer T3 stop controls (3)	T3	Screw (3)	Allows positioning of HV power supply stops.	78
Pitch generator	—5G variable resistor	R2	Rotary with lock (screwdriver adjust)	Adjusts frequency of —5G command of pitch generator.	
	ZERO G variable resistor	R7	Rotary with lock (screwdriver adjust)	Adjusts frequency of 0G command of pitch generator.	
Pulse generator	CODER COARSE variable resistor	R45	Rotary (knob adjust)	Adjusts coding interval (coarse adjustment).	

Table 66 (U). Missile Radar Control Console—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Missile radar control console—Continued					
Pulse generator—Continued	CODER FINE variable resistor	R44	Rotary (knob adjust)	Adjusts coding interval (fine adjustment).	
	RADAR variable resistor	R19	Rotary (knob adjust)	Adjusts time interval between preknock and sync pulses.	
Pulse repetition generator	–DEV variable resistor	R2	Rotary (knob adjust)	Adjusts minimum frequency of pulse repetition generator.	
	ZERO DEV variable resistor	R7	Rotary (knob adjust)	Adjusts center frequency of pulse repetition generator.	
Range indicator	MAX. SWEEP LENGTH variable resistor range indicator (missile)	R9	Rotary with lock (screwdriver adjust)	Adjusts sweep length in NIKE–AJAX mode of operation.	
Range track video amplifier	VERT CENT variable resistor	R9	Rotary with lock (screwdriver adjust)	Adjusted to center the sweep vertically.	
	VIDEO GAIN variable resistor	R6	Rotary with lock (screwdriver adjust)	Adjusts amplitude of video displayed on indicators.	
Track sweep generator	ASTIGMATISM variable resistor	R33	Rotary with lock (screwdriver adjust)	Corrects for astigmatism in presentation.	
	EXP WIDTH variable resistor	R42	Rotary with lock (screwdriver adjust)	Adjusts width of expanded area.	
	H CENT variable resistor	R18	Rotary with lock (screwdriver adjust)	Adjusted to center the sweep horizontally.	
	MAX SWEEP RANGE variable resistor	R9	Rotary with lock (screwdriver adjust)	Adjusts maximum range of sweep.	
	MIN. SW variable resistor	R45	Rotary with lock (screwdriver adjust)	Adjusts range of sweep in expanded position.	
	NB SWEEP LG variable resistor	R2	Rotary with lock (screwdriver adjust)	Adjusts sweep length.	
Test adapter	ATTENUATOR VOLTAGE switch	S1	Rotary (four-position)	Attenuates input used when measuring large amplitude voltages.	
	GAIN variable resistor	R10	Rotary (knob adjust)	Adjusts gain of test amplifier.	
	MEAS—CAL switch	S3	Toggle (two-position)	Selects one of two inputs to the test amplifier: calibration voltage, or input to be measured.	
	AMP CAL ON—AMP ON—OFF switch	S2	Toggle (three-position)	Selects one of three conditions for the test amplifier: AMP CAL ON for calibration, AMP ON for measuring, and OFF.	

Table 66 (U). Missile Radar Control Console—Behind Panel Controls and Indicators—Continued (*U*)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Missile radar control console—Continued					
Yaw generator	−5G variable resistor	R2	Rotary with lock (screw-driver adjust)	Adjusts frequency of −5G command of yaw generator.	
	ZERO G variable resistor	R7	Rotary with lock (screw-driver adjust)	Adjusts frequency of 0G command of yaw generator.	

105 (U). Target Ranging Radar Control

The controls and indicators of the target ranging radar control are located on the range power control-indicator, IF pre-amplifier, lin-log amplifier, target test IF signal generator, test scope, AFC control-indicator, +250 or +150 volt regulator, 20–30 second delay timer, target range synchronizer, and ±320v or +220v power supply. The nonplacarded control is shown on figure 82, and all controls and indicators are described in alphabetical order in table 67.

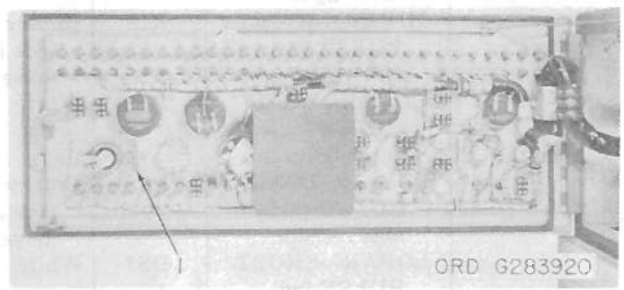


Figure 82 (U). Range radar power control-indicator—nonplacarded control (U).

Table 67 (U). Target Ranging Radar Control—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
20–30 second delay timer	Variable resistor	R11	Rotary with lock (screw-driver adjust)	Varies timer interval.	
+250 or +150 volt regulator	BALANCE variable resistor	R21	Rotary with lock (screw-driver adjust)	Adjusts output of regulator.	
±320v or +220v power supply	V ADJ SEC 1 (+) variable resistor	R22	Rotary with lock (screw-driver adjust)	Adjusts voltage output.	
	V ADJ SEC 2 (− OR +) variable resistor	R42	Rotary with lock (screw-driver adjust)	Adjusts voltage output.	
AFC control-indicator	XTAL CUR meter	M1		Indicates crystal current of AFC unit selected by S1.	
	XTAL CUR SEL switch	S1	Rotary (three-position)	Applies either AFC A or AFC B crystal current to M1. Normally left in OFF.	
IF pre-amplifier	GAIN ADJ variable resistor	R26	Rotary with lock (screw-driver adjust)	Adjusts noise level on TRR lin-log presentation.	
Lin-log amplifier	VID GAIN ADJ variable resistor	R52	Rotary with lock (screw-driver adjust)	Adjusts amplitude of TRR lin-log video.	

Table 67 (U). Target Ranging Radar Control—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Range radar power control-indicator	Phase adjust power switch	S17	Strap	Connects phase C power to LINE VOLTAGE meter on the range radar power control-indicator.	1, fig. 82
Target range synchronizer	HIPAR—LONG PULSE indicator light	DS6	White	Illuminates when using HIPAR long pulse mode.	
	HIPAR—LONG PULSE variable resistor	R8	Rotary with lock (screw-driver adjust)	Adjusts frequency of preknock and sync triggers for HIPAR long pulse mode.	
	HIPAR—SHORT PULSE indicator light	DS8	White	Illuminates when using HIPAR short pulse mode.	
	HIPAR—SHORT PULSE variable resistor	R12	Rotary with lock (screw-driver adjust)	Adjusts frequency of preknock and sync triggers for HIPAR short pulse mode.	
	LOPAR—LONG PULSE indicator light	DS5	White	Illuminates when using LOPAR long pulse mode.	
	LOPAR—LONG PULSE variable resistor	R6	Rotary with lock (screw-driver adjust)	Adjusts frequency of preknock and sync triggers for LOPAR long pulse mode.	
	LOPAR—SHORT PULSE indicator light	DS7	White	Illuminates when using LOPAR short pulse mode.	
	LOPAR—SHORT PULSE variable resistor	R10	Rotary with lock (screw-driver adjust)	Adjusts frequency of preknock and sync triggers for LOPAR short pulse mode.	
	MAG A—LONG PULSE indicator light	DS1	White	Illuminates when using magnetron A in the long pulse mode.	
	MAG A—LONG PULSE variable resistor	R26	Rotary with lock (screw-driver adjust)	Adjusts main delay of sync trigger for magnetron A during long pulse mode.	
	MAG A—SHORT PULSE indicator light	DS3	White	Illuminates when using magnetron A in the short pulse mode.	
	MAG A—SHORT PULSE variable resistor	R27	Rotary with lock (screw-driver adjust)	Adjusts main delay sync trigger for magnetron A during short pulse mode.	
	MAG B—LONG PULSE indicator light	DS2	White	Illuminates when using magnetron B in the long pulse mode.	
	MAG B—LONG PULSE variable resistor	R28	Rotary with lock (screw-driver adjust)	Adjusts main delay of sync trigger for magnetron B during long pulse mode.	
	MAG B—SHORT PULSE indicator light	DS4	White	Illuminates when using magnetron B in the short pulse mode.	
	MAG B—SHORT PULSE variable resistor	R29	Rotary with lock (screw-driver adjust)	Adjusts main delay of sync trigger for magnetron B during short pulse mode.	
	PLX CORRECTION switch	S2	Toggle (two-position)	Operated to ZERO position when measuring parallax offset voltages. Normally left in NORM.	

Table 67 (U). Target Ranging Radar Control—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target test IF signal generator	DELAY ADJUST knob	R3	Rotary (vernier)	Adjusts time delay between sync pulse and 60-mc output pulse.	
	LONG PULSE—SHORT switch	S1	Toggle (two-position)	Selects long or short pulse test signal output.	
	OSC FREQ ADJUST knob	C16	Rotary	Adjusts frequency of 60-mc oscillator.	
	OUTPUT ATTEN. coarse switch	AT1–B	Rotary (six-position)	Attenuates output from 0 db through 50 db in increments of 10 db.	
	OUTPUT ATTEN. fine switch	AT1–A	Rotary (10-position)	Attenuates output from 0 db through 9 db in increments of 1 db.	
	OUTPUT ATTEN. switch	S2	Toggle (two-position)	When set to 20, attenuates output 20 db.	
Test scope	FOCUS variable resistor	R843	Rotary (knob adjust)	Adjusts focus of display.	
	HORIZONTAL DISPLAY switch	SW300	Rotary (three-position)	Selects either normal, expanded, or external sweep display.	
	Horizontal POSITIONING variable resistor	R314	Rotary with lock (screwdriver adjust)	Adjusted to center sweep presentation horizontally.	
	INPUT—DC–AC switch	SW401	Rotary (two-position)	Selects type of input circuit.	
	INTENSITY variable resistor	R825	Rotary (knob adjust)	Adjusts brilliancy of display.	
	POWER ON switch	SW600	Toggle (two-position)	Applies power to test scope.	
	SCALE ILLUM. variable resistor	R600	Rotary (knob adjust)	Adjusts brilliancy of scale illumination.	
	STABILITY variable resistor	R110	Rotary (black knob adjust)	Adjusts stability of sweep.	
	TIME/DIV. switch	SW160	Rotary (22-position)	Adjusts length of sweep.	
	TRIGGERING LEVEL variable resistor	R29	Rotary (red knob adjust)	Adjusts amplitude of sync pulse required to start sweep.	
	TRIGGER SELECTOR switch	SW20	Rotary (six-position)	Selects polarity of input trigger required.	
	TRIGGER SELECTOR switch	SW10	Rotary (four-position)	Selects type of input trigger required.	
	VERTICAL POSITIONING variable resistor	R531	Rotary with lock (screwdriver adjust)	Adjusted to center sweep presentation vertically.	
	VOLTS/DIV. variable resistor	R516	Rotary (knob adjust)	Adjusts vertical gain of scope.	
	VOLTS/DIV. switch	SW420	Rotary (12-position)	Selects vertical sensitivity of scope.	

Section III (U). LOPAR ANTENNA-RECEIVER-TRANSMITTER GROUP; MISSILE TRACK, TARGET TRACK, AND TARGET RANGE ANTENNA-RECEIVER-TRANSMITTER GROUPS; AND RADAR TEST SET GROUP

106 (U). Missile Track Antenna-Receiver-Transmitter Group

The controls and indicators of the missile track antenna-receiver-transmitter group are located on the electrical test panel, high-power servo amplifier, track antenna reflector assembly support, pressurization unit, track amplifier-converter, track RF control-power supply group, dehumidifiers, frequency error converter, power monitor, missile track receiver-transmitter, track antenna pedestal, skin track AFC, target or missile transfer control-indicator, track RF control power supply, and azimuth drive equipment enclosure. The nonplacarded controls and indicators are shown on figures 83 through 86, and all controls and indicators are described in alphabetical order in table 68.

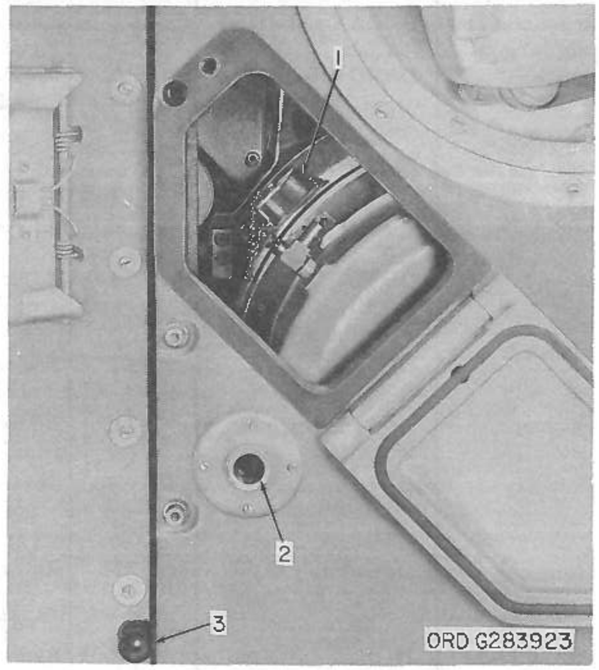


Figure 84 (U). Elevation position or elevation correction transmitter—nonplacarded controls or indicators (U).

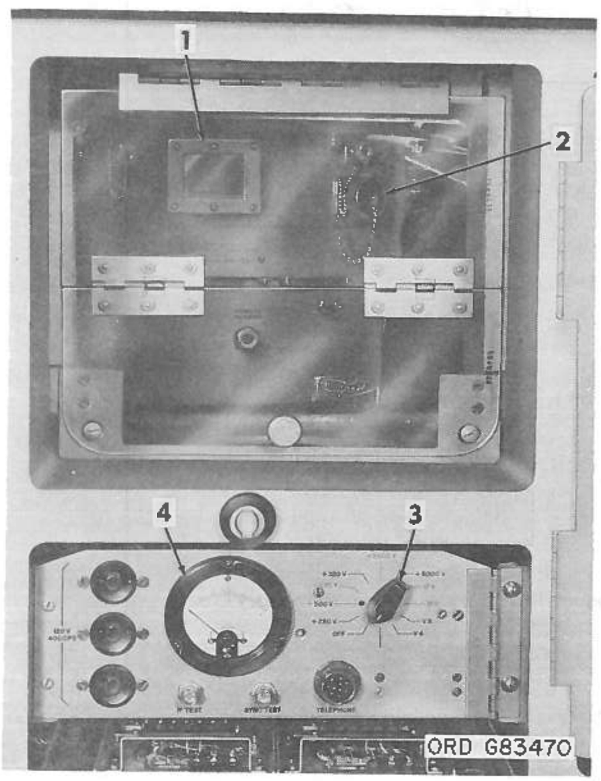


Figure 83 (U). Target track antenna support base or azimuth drive equipment enclosure—center compartment—nonplacarded controls and indicators (U).

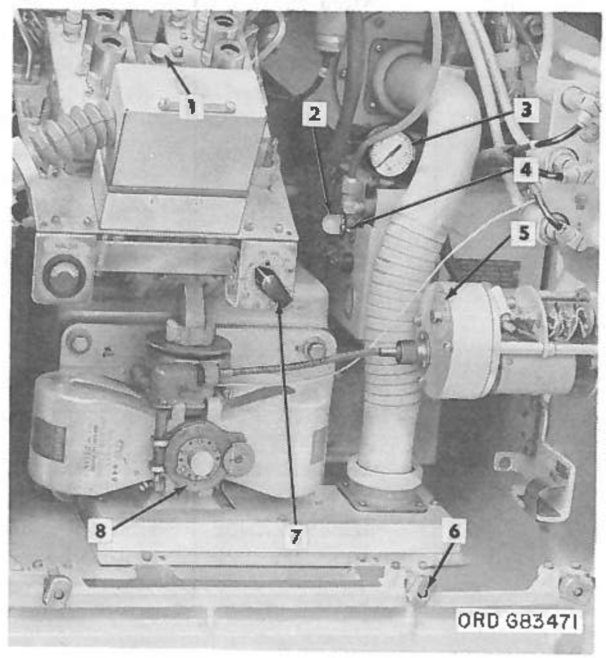


Figure 85 (U). Track receiver-transmitter—nonplacarded controls and indicators (U).

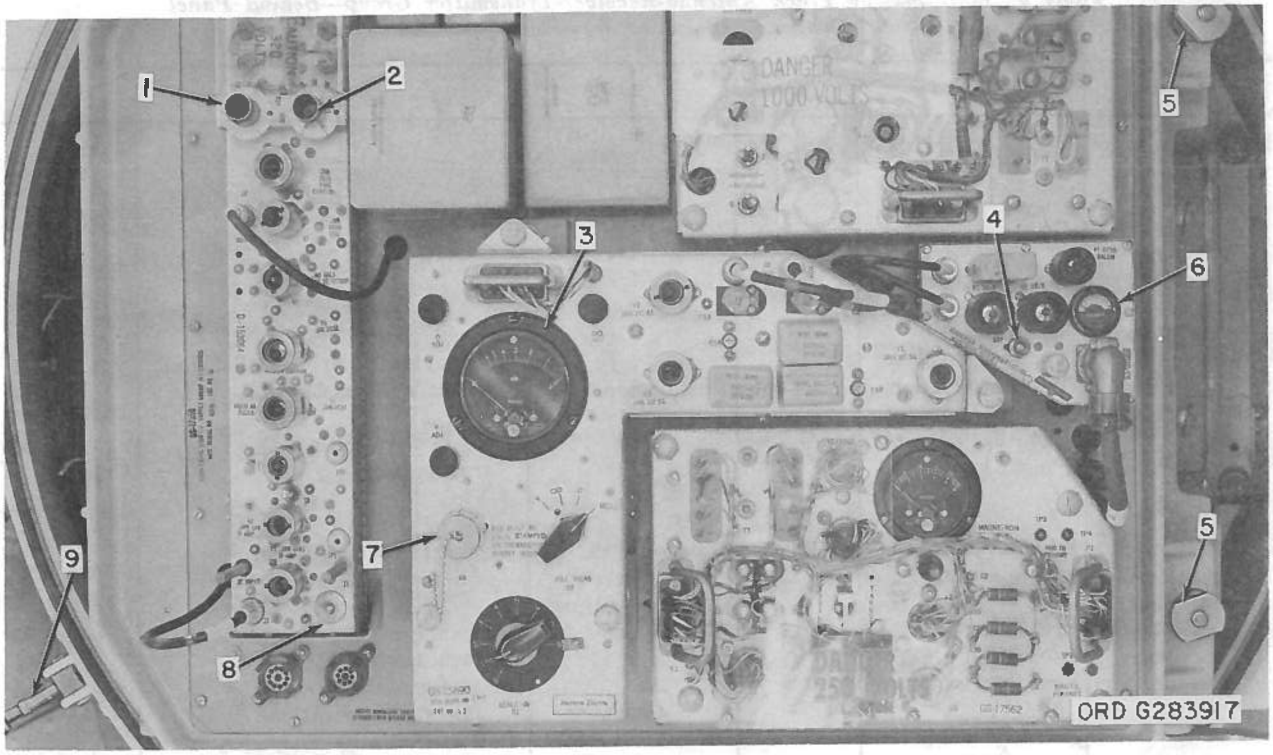


Figure 86 (U). Track RF control-power supply group—nonplacarded controls and indicators (U).

Table 68 (U). Missile Track Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Missile track antenna-receiver-transmitter					
Antenna base					
Azimuth drive equipment enclosure	Azimuth adjustment knob			Adjusts azimuth position transmitter.	2, fig. 83
	Azimuth dial			Indicates azimuth of track antenna.	1, fig. 83
	HP EL (or AZ) AMP BAL switches	S9, S7, S5, and S6	Toggle (two-position, springloaded to right)	Removes input to amplifier.	
Electrical test panel	Test meter	M1		Indicates amplitude of voltages selected by test switch.	4, fig. 83
	Test switch	S10	Rotary (11-position)	Selects voltage in the azimuth drive equipment enclosure to be measured with test meter.	3, fig. 83

Table 68 (U). Missile Track Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Missile track antenna-receiver-transmitter—Continued					
Antenna base—Continued					
Track antenna pedestal	Dial eyepiece			Allows viewing of elevation dial.	3, fig. 84
	Dial illumination switch	S1	Pushbutton	Illuminates elevation dial.	2, fig. 84
	Elevation adjustment knob			Adjusts elevation position transmitter.	1, fig. 84
High-power servo amplifier	BALANCE variable resistor	R5	Rotary with lock (screwdriver adjust)	Balances output with zero input.	
Missile track receiver-transmitter	Pressure meter		Mechanical	Indicates pressure in missile track waveguide.	3, fig. 85
	Relative frequency dial			Indicates relative frequency of magnetron operation.	5, fig. 85
	Relative magnetron frequency dial			Indicates relative frequency of magnetron operation.	8, fig. 85
	Variable attenuator	E7	Mechanical (with screwdriver lock)	Adjusts crystal current.	1, fig. 85
Pressurization unit	Power indicator light	I1	**Clear**	Illuminates when power is applied to compressor.	2, fig. 85
	Power switch	S1	Toggle (two-position)	Applies power to compressor.	4, fig. 85
Track amplifier-converter	Crystal current switch	S1	Rotary (10-position)	Selects crystals CR1 through CR8 for monitoring.	7, fig. 85
	XTAL-CUR. meter	M1		Indicates current of crystal selected by the crystal current switch.	
Track RF control power supply group					
Dehumidifier	28VDC—ON indicator light	I2	Amber	Illuminates when 28 volts is applied to dehumidifier.	
	115-400CY—ON indicator light	I1	Clear	Illuminates when 115 volts is applied to dehumidifier.	
	HUMIDITY INDICATOR		Desiccant	Indicates the amount of moisture in the waveguide.	
Frequency error converter	Current meter	M1		Indicates current flowing in output stage of frequency error converter and is indication of overall gain.	5, fig. 86
	Gain variable resistor	R12	Rotary with lock (screwdriver adjust)	Adjusts gain of the frequency error converter.	4, fig. 86

Table 68 (U). Missile Track Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Missile track antenna-receiver-transmitter—Continued					
Missile track receiver-transmitter—Continued					
Track RF control power supply group—Continued					
Power monitor	ADJ—MEAS switch	S2	Rotary (four-position)	Selects one of four conditions for the power monitor: V for reference voltage adjustment ∞ for balancing RF bridge network, 0 for compensation for different attenuations of directional couplers, and MEAS for power measurements.	
	0 ADJ variable resistor	R21	Rotary (knob adjust)	Calibrates meter for the particular attenuation value of the directional coupler.	
	∞ ADJ variable resistor	R7	Rotary (knob adjust)	Balances comparator bridge of power monitor.	
	Power monitor test meter	M1	0—∞ calibrated in db	Indicates average transmitter power from 51.5 db with 51.5 as 0 reference.	3, fig. 86
	SCALE—db switch	S1	Rotary (11-position)	Calibrates power monitor to directional coupler in increments of 1 db.	
	Scale db switch	S3	Rotary (11-position)	Calibrates power monitor to directional coupler in increments of 0.1 db.	7, fig. 86
	V ADJ variable resistor	R27	Rotary (knob adjust)	Balances RF bridge of power monitor.	
Skin track AFC	AFC indicator light	I1	Clear	Indicates status of AFC operation.	8, fig. 86
	Level adjust variable resistor	R36	Rotary with lock (screwdriver adjust)	Adjusts amplitude of the AFC output.	2, fig. 86
	Sweep adjust variable resistor	R39	Rotary with lock (screwdriver adjust)	Controls the AFC sweep time duration.	1, fig. 86

Table 68 (U). Missile Track Antenna-Receiver-Transmitter Group—Behind Panel controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Missile track antenna-receiver-transmitter—Continued Missile track receiver-transmitter—Continued Track RF control power supply group—Continued					
Target or missile transfer control-indicator	MAGNETRON CURRENT meter	M1		Indicates magnetron current and 2 volts pulse transformer bias when PUSH TO READ 2 VOLTS switch S1 is depressed.	
	PUSH TO READ 2 VOLTS switch	S1	Pushbutton	Connects pulse transformer bias to MAGNETRON CURRENT meter M1.	
Track RF control power supply	FREQUENCY—DECREASE switch	S2	Toggle (two-position, springloaded to left)	Decreases transmitter frequency.	
	FREQUENCY—INCREASE switch	S1	Toggle (two-position, springloaded to right)	Increases transmitter frequency.	
	HIGH END ADJUST variable resistor	R7	Rotary with lock (screwdriver adjust)	Adjusts the repeller voltage for high frequency operation of the local oscillator for target track or skin track AFC operation.	
	LOW END ADJUST variable resistor	R9	Rotary with lock (screwdriver adjust)	Adjusts repeller voltage for low frequency operation of the local oscillator for target track or skin track AFC operation.	

107 (U). Target Track Antenna-Receiver-Transmitter Group

The controls and indicators of the target track antenna-receiver-transmitter group are located on the high-power servo amplifier, electrical test panel, pressurization unit, target track amplifier-converter, dehumidifier, power monitor, remote magnetron metering control-indicator, target track AFC, target track RF control-power supply, target track RF control-power supply group, target track receiver-transmitter, target track antenna support, and target track antenna support base. The non-placarded controls and indicators are shown on figures 83, 84, 87, and 88 and all controls and indicators are described in table 69.

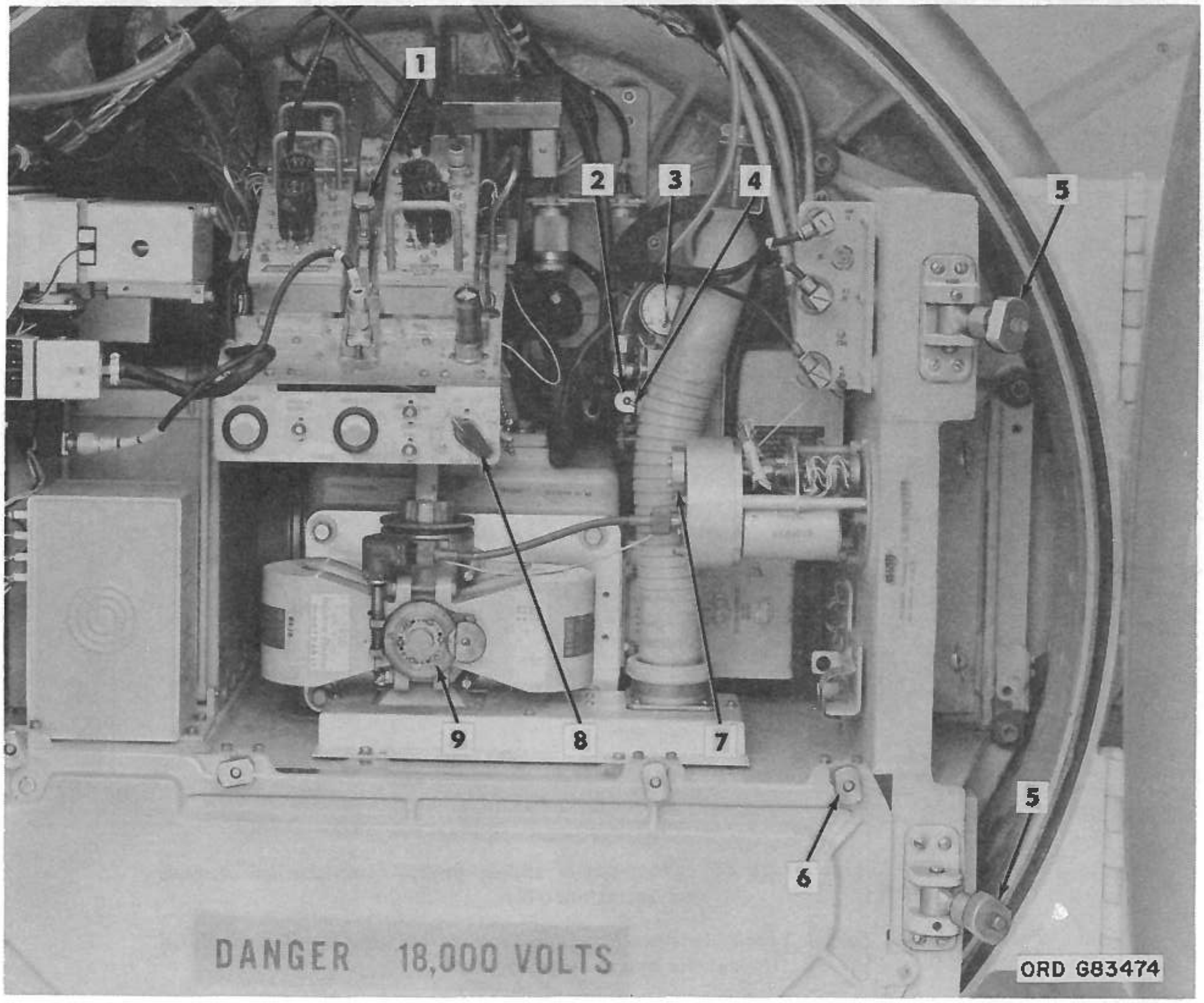


Figure 87 (U). Target track receiver-transmitter—nonplacarded controls and indicators (U).

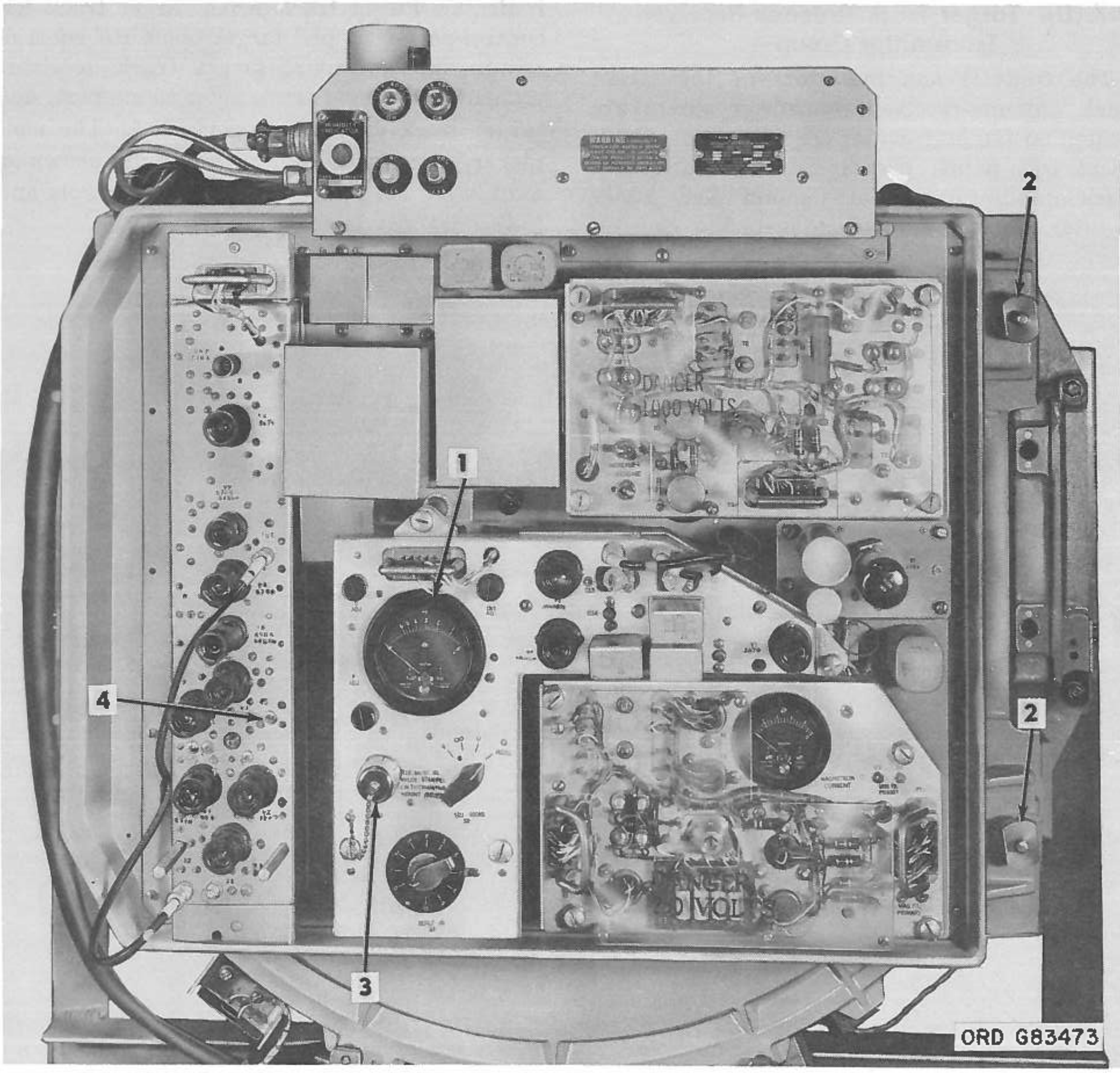


Figure 88 (U) Target track RF control-power supply group—nonplacarded controls and indicators (U).

Table 69 (U). Target Track Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target track antenna-receiver-transmitter High-power servo amplifier	BALANCE variable resistor	R5	Rotary (with lock)	Balances output with zero input.	

Table 69 (U). Target Track Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target track antenna-receiver-transmitter—Continued					
Target track antenna-support group					
Target track antenna support	Dial eyepiece			Allows viewing of elevation dial.	3, fig. 84
	Dial illumination switch	S1	Pushbutton	Illuminates elevation dial.	2, fig. 84
	Elevation adjustment knob			Adjusts elevation position transmitter.	1, fig. 84
Target track antenna support base	Azimuth adjustment knob			Adjusts azimuth position transmitter.	2, fig. 83
	Azimuth dial			Indicates azimuth of track antenna.	1, fig. 83
	HP EL (or AZ) AMP BAL switches	S9, S5, S6, and S7	Toggle (two-position, springloaded to right)	Removes input to amplifier.	
Electrical test panel	Test meter	M1		Indicates amplitude of voltages selected by test switch.	4, fig. 83
	Test switch	S10	Rotary (11-position)	Selects voltage in the azimuth drive equipment enclosure or target track antenna support base to be measured with test meter.	3, fig. 83
Target track receiver-transmitter	Pressure meter	M1	Mechanical	Indicates pressure in target track waveguide.	3, fig. 87
	Relative frequency dial			Indicates relative frequency of magnetron operation.	7, fig. 87
	Relative magnetron frequency dial			Indicates relative frequency of magnetron operation.	9, fig. 87
	Variable attenuator	E7	Mechanical (with screwdriver lock)	Adjusts crystal current.	1, fig. 87
Pressurization unit	Power indicator light	I1	Clear	Illuminates when power is applied to compressor.	2, fig. 87
	Power switch	S1	Toggle (two-position)	Applies power to compressor.	4, fig. 87

Table 69 (U). Target Track Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target track antenna-receiver-transmitter—Continued					
Target track receiver-transmitter—Continued					
Receiver transmitter radar subassembly					
Target track amplifier-converter	Crystal current switch	S1	Rotary (10-position)	Selects crystals CR1 through CR8 for monitoring.	8, fig. 87
	DIODE ADJ. HI END variable resistor	R4	Rotary with lock (screwdriver adjust)	Adjusts maximum frequency of local oscillator.	
	DIODE ADJ. LOW END—COARSE variable resistor	R14	Rotary with lock (screwdriver adjust)	Adjusts minimum frequency of local oscillator.	
	DIODE ADJ LOW END—FINE variable resistor	R5	Rotary with lock (screwdriver adjust)	Adjusts minimum frequency of local oscillator.	
	TUNER DIODE CUR. meter	M2		Indicates tuner diode current.	
	XTAL CUR. meter	M1		Indicates current of crystal selected by crystal current switch S1.	
Target track RF control-power supply group	HIGH END ADJUST variable resistor	R7	Rotary with lock (screwdriver adjust)	Adjusts the repeller voltage for high frequency operation of the local oscillator for target track or skin track AFC operation.	
	LOW END ADJUST variable resistor	R9	Rotary with lock (screwdriver adjust)	Adjusts repeller voltage for low frequency operation of the local oscillator for target track or skin track AFC operation.	
Dehumidifier	28 VDC—ON indicator light	I2	Amber	Illuminates when 28 volts is applied to dehumidifier.	
	115V-400CY—ON indicator light	I1	Clear	Illuminates when 115 volts is applied to dehumidifier.	
	HUMIDITY INDICATOR		Desiccant	Indicates amount of moisture in the waveguide.	

Table 69 (U). Target Track Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target track antenna-receiver-transmitter—Continued					
Target track receiver-transmitter—Continued					
Target track RF control-power supply group—Continued					
Power monitor	ADJ—MEAS switch	S2	Rotary four-position)	Selects one of four conditions for the power monitor: V for reference voltage adjustment, ∞ for balancing RF bridge network, 0 for compensation for different attenuations of directional couplers, and MEAS for power measurements.	
	0 ADJ variable resistor	R21	Rotary (knob adjust)	Calibrates meter for the particular attenuation value of the directional coupler.	
	∞ ADJ variable resistor	R7	Rotary (knob adjust)	Balances comparator bridge of power monitor.	
	Power monitor test meter	M1	0—∞ calibrated in db	Indicates average transmitter power from 54.5 db, with 54.5 db as 0 reference.	1, fig. 88
	Scale—db switch	S3	Rotary (11-position)	Calibrates power monitor to directional coupler in increments of 0.1 db.	3, fig. 88
	SCALE—db switch	S1	Rotary (nine-position)	Calibrates power monitor to directional coupler in increments of 1 db.	
	V ADJ variable resistor	R27	Rotary (knob adjust)	Balances RF bridge of power monitor.	
Remote magnetron metering control-indicator	HIPAR METER SHUNT switch	S1	Rotary	Varies current through MAGNETRON CURRENT meter.	
	MAGNETRON CURRENT meter	M1		Indicates magnetron current.	

Table 69 (U). Target Track Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target track antenna-receiver-transmitter—Continued					
Target track receiver transmitter—Continued					
Target track RF control-power supply group—Continued					
Target track AFC	SWP TIME variable resistor	R70	Rotary (with lock)	Adjusts the AFC sweep time duration.	
	Variable inductor L5	L5	Rotary with lock (screwdriver adjust)	Balances discriminator circuit for proper AFC operation.	4, fig. 88
Target track RF control-power supply	FREQUENCY—DECREASE-INCREASE switch	S1	Toggle (two-position)	Decreases or increases magnetron frequency when FREQUENCY-TUNE switch is operated.	
	FREQUENCY-TUNE switch	S2	Toggle (two-position, springloaded to right)	Changes magnetron frequency depending on position of FREQUENCY—DECREASE-switch.	

108 (U). Target Range Antenna-Receiver-Transmitter Group

The controls and indicators of the target range antenna-receiver-transmitter group are located on the antenna control computer, azimuth correction transmitter, compressor-dehydrator, dehumidifier, pressurization unit, high-power servo amplifier, meter panel, panoramic control, RF power test set, AFC IF pre amplifier, panoramic frequency mixer stage, range A frequency mixer stage, range B frequency mixer stage, tuning drive, range RF control-power supply group, range receiver-transmitter, AFC, meter control-indicator, range antenna pedestal, and range antenna support base. The nonplacarded controls and indicators are shown in figures 84, and 89 through 92, and all controls and indicators are described in alphabetical order in table 70.

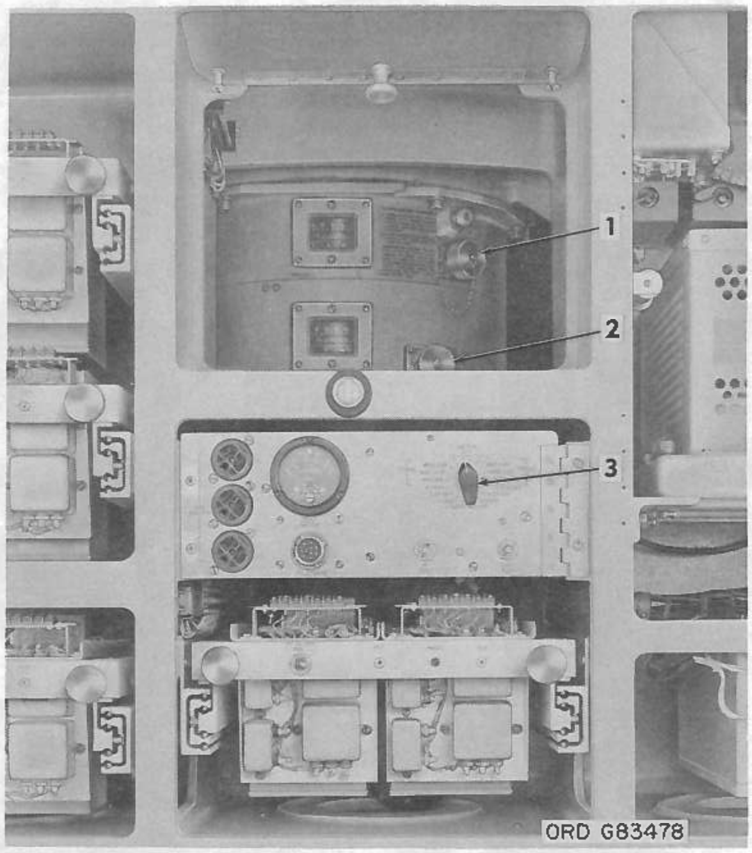


Figure 89 (U). Range antenna support base—center compartment—nonplacarded controls and indicators (U).

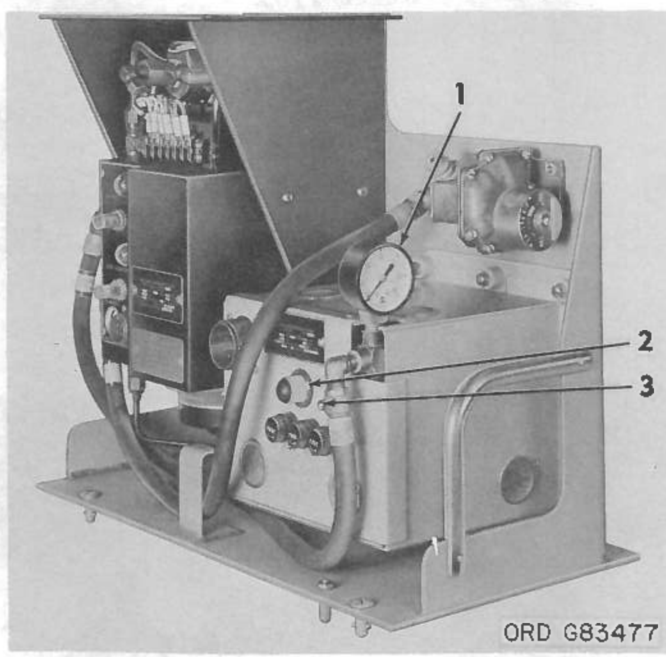


Figure 90 (U). Compressor – dehydrator—nonplacarded controls and indicators (U)

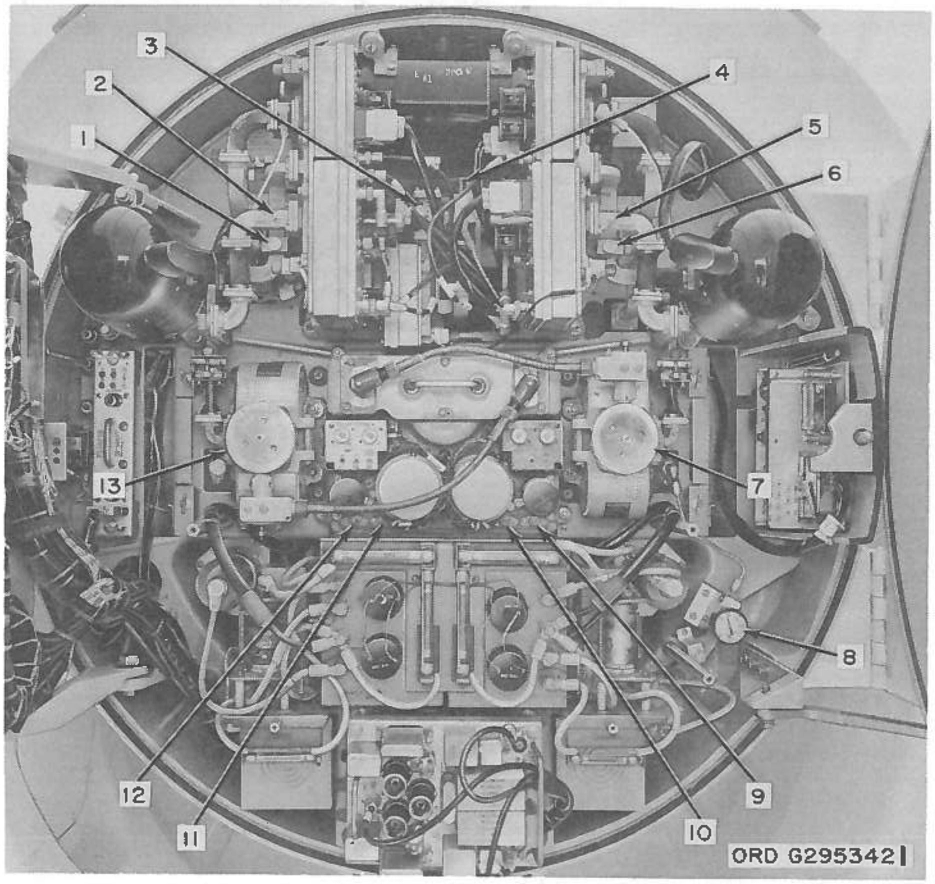


Figure 91 (C). Range receiver transmitter—nonplacarded controls and indicators (U).

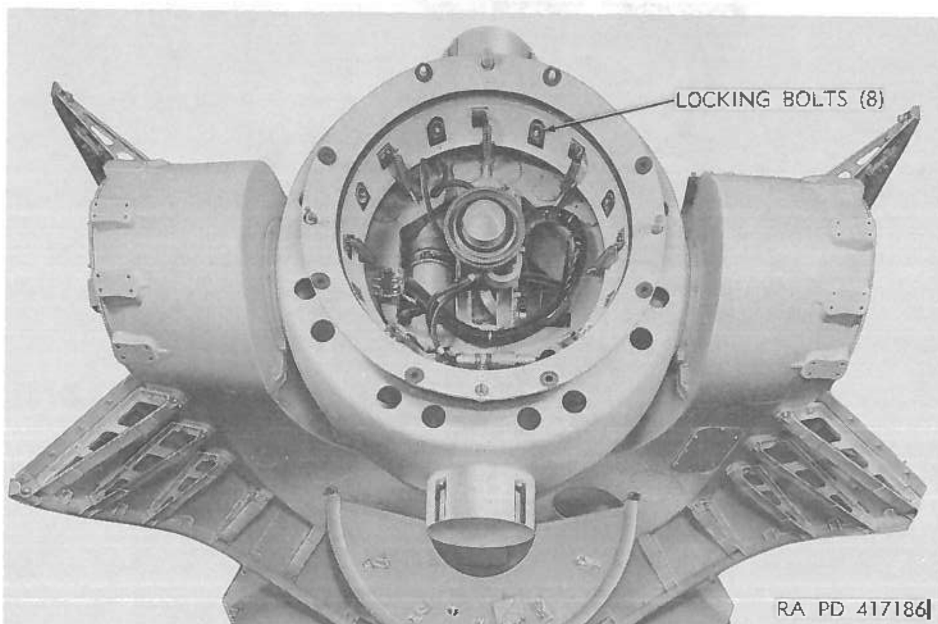


Figure 91.1 (U). Track antenna reflector assembly support—locking bolts (U).

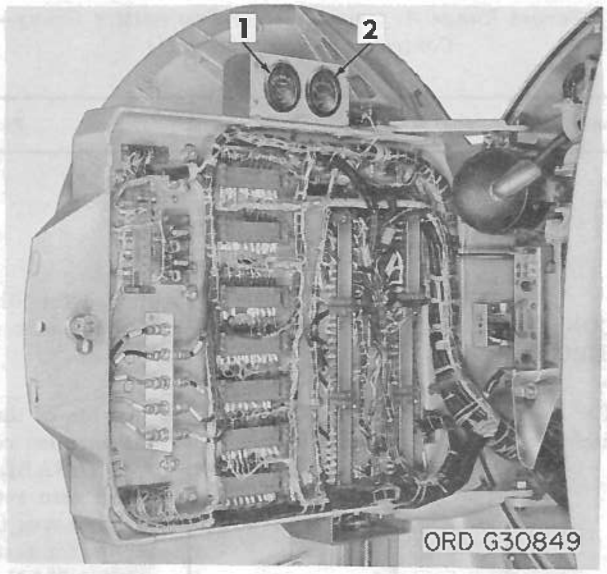


Figure 92 (U). Range RF control-power supply group —rear view—nonplacarded indicators (U).

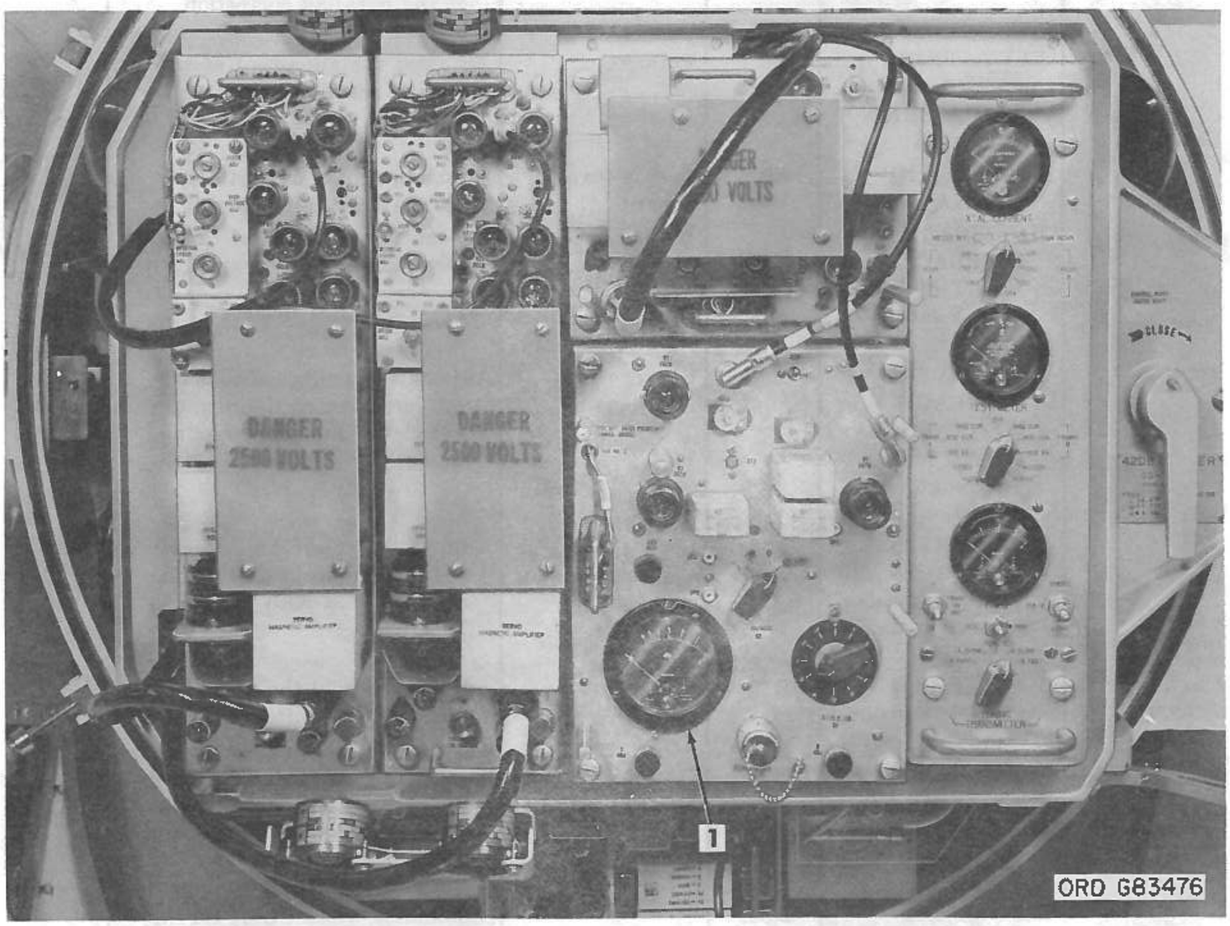


Figure 93 (C). | *Range RF control-power supply—nonplacarded controls and indicators (U).*

Table 70 (U). Target Range Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target range antenna-receiver-transmitter					
Antenna control computer	AZIMUTH SERVO CONTROL—ZERO ADJ knob	B1	Rotary	Adjusted for alinement of the slaving servo system.	
	COMPUTER TEST switch	S1	Rotary (three-position)	Selects one of three conditions for the parallax correction system: AZS DISABLE disables automatic zero set (AZS) circuits and removes the AZS circuit inputs for tests and adjustments; MAN ZERO disables AZS circuits and the parallax correction inputs are removed; NORM allows normal operation of the parallax correction system.	
	ELEVATION SERVO CONTROL—ZERO ADJ knob	B3	Rotary	Adjusted for alinement of the slaving servo system.	
	HIGHER ANTENNA switch	S3	Toggle (two-position)	Adjusts polarity of vertical parallax correction signal.	
	HORIZONTAL DISPLACEMENT dial (range correction)		Rotary	Indicates the horizontal range correction value in yards.	
	HORIZONTAL DISPLACEMENT variable resistor and dial (angular correction)	R41	Rotary (knob adjust)	Adjusts the angle correction voltages sent to the azimuth and elevation servo coupling networks.	
	HORIZONTAL DISPLACEMENT variable resistor (range correction)	R37	Rotary (knob adjust)	Adjusts the range correction voltage for horizontal displacement of TRR with respect to TTR.	
	MAN ZERO 1 variable resistor	R10	Rotary	Adjusted to hold the dc amplifier drift within limits during failure or during maintenance of automatic zero set equipment.	
	MAN ZERO 2 variable resistor	R20	Rotary	Adjusted to hold the dc amplifier drift within limits during failure or during maintenance of automatic zero set equipment.	
	RG PLX DISABLE indicator light	DS1		Illuminates when COMPUTER TEST switch is set to MAN ZERO.	

Table 70 (U). Target Range Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Target range antenna-receiver-transmitter—Continued					
Antenna control computer—Continued	VERTICAL DISPLACEMENT dial (range correction)		Rotary	Indicates the vertical displacement between TTR and TRR.	
	VERTICAL DISPLACEMENT variable resistor (range correction)	R38	Rotary (screwdriver adjust)	Used to set in the vertical displacement of TRR with respect to TTR.	
Azimuth correction transmitter	AZIMUTH DIAL			Indicates azimuth of range antenna.	
	Azimuth knob			Adjusts azimuth correction transmitter.	2, fig. 89
	BASE LINE AZIMUTH DIAL			Indicates azimuth angle φ of baseline between TTR and TRR, referenced to TTR.	
	Base line azimuth knob			Adjusts azimuth base line setting.	1, fig. 89
Compressor-dehydrator	Pressure meter	M1	Mechanical	Indicates pressure in TRR waveguide.	1, fig. 90
Dehumidifier	28VDC—ON indicator light	I2	Amber	Illuminates when 28 volts is applied to dehumidifier.	
	115V-400CPS—ON indicator light	I1	Clear	Illuminates when 115 volts is applied to dehumidifier.	
Pressurization unit	Power indicator light	I1	Clear	Illuminates when power is applied to compressor.	2, fig. 90
	Power switch	S1	Toggle (two-position)	Applies power to compressor.	3, fig. 90
High-power servo amplifier	BALANCE variable resistor	R5	Rotary with lock (screwdriver adjust)	Balances output with zero input.	
Meter panel	PRF SET variable resistor	R40	Rotary (knob adjust)	Varies current through TEST METER.	
	TEST METER	M1		Monitors voltages and current selected by test switch.	
	Test switch	S1	Rotary (18-position)	Selects voltages and current to be monitored with TEST METER.	3, fig. 89
Range receiver-transmitter	Magnetron A tuning dial			Indicates relative frequency of magnetron A.	13, fig. 91
	Magnetron B tuning dial			Indicates relative frequency of magnetron B.	7, fig. 91
	Pressure meter	M1		Indicates pressure in TRR waveguide.	8, fig. 91
	Antenna reflector locking bolts		Mechanical	Determines the tilt of the range antenna reflector with respect to the waveguide switch.	fig. 91.1

Table 70 (U). Target Range Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target range antenna-receiver-transmitter—Continued					
Range receiver-transmitter—Continued					
Range RF control-power supply group	Crystal current meter	M1		Monitors current of receiver crystal selected by XTAL CURRENT switch S1.	1, fig. 92
	Magnetron frequency meter	M2		Indicates relative TRR magnetron frequency.	2, fig. 92
AFC	ALIGN ADJ variable resistor (2)	R35	Rotary with lock (screwdriver adjust)	Adjusts for 0 indication at TP–3.	
	FIRST ANODE VOLTAGE ADJ variable resistor (2)	R62	Rotary with lock (screwdriver adjust)	Adjusts first anode voltage applied to backward-wave oscillator (BWO).	
	GAIN ADJ variable resistor (2)	R43	Rotary with lock (screwdriver adjust)	Adjusts amplitude of IF video applied to discriminator during long pulse mode.	
	HIGH VOLTAGE adjust variable resistor (2)	R60	Rotary with lock (screwdriver adjust)	Adjusts bias on differential amplifier.	
	RESIDUAL ERROR ADJ variable resistor (2)	R13	Rotary with lock (screwdriver adjust)	Adjusted to produce minimum oscillation of AFC motor-generator during tracking condition.	
	TEST—OPR switch (2)	S1	Toggle (two-position)	In TEST position, disables sweep motor and allows alinement of sweep circuits.	
	TRACK ADJ variable resistor (2)	R41	Rotary (with lock)	Adjusts to compensate for magnetron tuning curve at low end of tuning range.	
Meter control-indicator	FREQ meter	M2		Indicates relative TRR magnetron frequency.	
	FREQ switch	S3	Toggle (three-position, springloaded to center)	Decreases frequency of magnetron when set to DCR and increases frequency of magnetron when set to INCR. When set to REMOTE magnetron frequency is controlled from the trailed mounted tracking station.	
	PULSE switch	S5	Toggle (two-position)	Selects proper meter shunts for FREQ meter and selects the pulse width of the radars in SHORT or LONG pulse position.	

Table 70 (U). Target Range Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target range antenna-receiver-transmitter—Continued					
Range receiver-transmitter—Continued					
Range RF control power supply group—Continued					
Meter control-indicator—Continued	TEST METER	M3		Monitors inputs selected by TEST METER switch S4.	
	TEST METER switch	S4	Rotary (12-position)	Selects inputs to TEST METER for monitoring transmitter operation.	
	TRANS ON ANT switch	S6	Toggle (two-position)	Selects transmitter A or B for operation.	
	TUNING TRANSMITTER switch	S2	Rotary (five-position)	Selects tuning rate of A and B magnetrons.	
	XTAL CURRENT meter	M1		Monitors current of receiver crystals selected by XTAL CURRENT switch S1.	
	XTAL CURRENT switch	S1	Rotary (12-position)	Selects receiver crystals for monitoring on XTAL CURRENT meter.	
Panoramic control	FIRST ANODE VOLTAGE ADJ variable resistor (2)	R26	Rotary with lock (screwdriver adjust)	Adjusts first anode voltage applied to BWO.	
	SWEEP CENTERING variable resistor	R23	Rotary with lock (screwdriver adjust)	Adjusts range of sweep voltage applied to BWO.	
	TEST switch	S1	Pushbutton	Grounds input of V2 to permit centering of sweep.	
RF power test set	0 ADJ variable resistor	R21	Rotary (knob adjust)	Calibrates meter for the particular attenuation value of the power directional coupler.	
	∞ ADJ variable resistor	R7	Rotary (knob adjust)	Balances comparator bridge of RF power test set.	

Table 70 (U). Target Range Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target range antenna-receiver-transmitter—Continued Range receiver-transmitter—Continued Range RF control power supply group—Continued RF power test set—Continued	ADJ-MEAS switch	S2	Rotary (four-position)	Selects one of four conditions for the power monitor: V for reference voltage adjustment, ∞ for balancing RF bridge network, 0 for compensation for different attenuations of directional couplers, and MEAS for power measurements.	
	SCALE-DB switch	S1	Rotary (nine-position)	Calibrates RF power test set to power directional coupler in increments of 1 db.	
	SCALE 0.1 DB switch	S3	Rotary (11-position)	Calibrates RF power test set to power directional coupler in increments of 0.1 db.	
	Test meter	M1	0—∞ calibrated in db	Indicates average transmitter power down from 48 dbm, with 48 as 0 reference.	1, fig. 93
	V ADJ knob	R27	Rotary	Balances RF bridge in RF power test set.	
Receiver-transmitter subassembly					
AFC IF pre amplifier	CW INCR variable resistor (2)	R13	Rotary with lock (screwdriver adjust)	Adjusts IF gain to appropriate receiver AFC unit.	
Panoramic frequency mixer stage	Variable attenuator	AT-2		Adjusts amplitude of receiver A and B pulses in panoramic receiver.	4, fig. 91
	Variable attenuator	AT-4		Adjusts panoramic receiver crystal current.	3, fig. 91
Range A frequency mixer stage	Variable attenuator	AT-2		Adjusts signal level applied to receiver A AFC IF pre amplifier.	2, fig. 91
	Variable attenuator	AT-6		Adjusts receiver A crystal current.	1, fig. 91

Table 70 (U). Target Range Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Target range antenna-receiver-transmitter—Continued Range receiver-transmitter—Continued Receiver-transmitter subassembly—Continued Range B frequency mixer stage	Variable attenuator	AT-2		Adjusts signal level applied to receiver B AFC IF pre amplifier.	5, fig. 91
	Variable attenuator	AT-6		Adjusts receiver B crystal current.	6, fig. 91
Target range antenna support group Range antenna pedestal	Dial eyepiece			Allows viewing of elevation dial.	2, fig. 84
	Dial illumination switch	S1	Pushbutton	Illuminates elevation dial.	3, fig. 84
	Elevation adjustment knob			Adjusts elevation correction transmitter.	1, fig. 84
	HUMIDITY INDICATOR		Desiccant	Indicates amount of moisture in waveguide.	
Range antenna support base	COMPUTER TEST switch	S1	Rotary (three-position)	Selects one of three conditions for the parallax correction system: AZS DISABLE disables automatic zero set (AZS) circuits and removes the AZS circuit inputs for tests and adjustments; MAN ZERO disables AZS circuits and the parallax correction inputs are removed; NORM allows normal operation of the parallax correction system.	
	HP EL (or AZ) AMP BAL switches	S9, S7, S6, and S5	Toggle (two-position, springloaded to right)	Removes input to associated amplifier.	

Table 70 (U). Target Range Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Target range antenna-receiver-transmitter—Continued					
Range receiver-transmitter—Continued					
Tuning drive	FREQ MTR TRIM MAG A variable resistor	R12	Rotary with lock (screwdriver adjust)	Establishes voltage limit for low frequency indication on frequency meter for magnetron A.	
	FREQ MTR TRIM MAG A variable resistor	R14	Rotary with lock (screwdriver adjust)	Establishes voltage limit for high frequency indication on frequency meter for magnetron A.	
	FREQ MTR TRIM MAG B—LIMIT variable resistor	R5	Rotary with lock (screwdriver adjust)	Establishes voltage limit for low frequency indication on frequency meter for magnetron B.	
	FREQ MTR TRIM MAG B—SLOW TUNE variable resistor	R7	Rotary with lock (screwdriver adjust)	Establishes voltage limit for high frequency indication on frequency meter for magnetron B.	
	Sensitive switch	S1	Cam controlled (screwdriver adjust)	Prevents magnetron B from being tuned beyond the established high frequency limit.	12, fig. 91
	Sensitive switch	S2	Cam controlled (screwdriver adjust)	Prevents magnetron A from being tuned beyond the established high frequency limit.	9, fig. 91
	Sensitive switch	S3	Cam controlled (screwdriver adjust)	Prevents magnetron B from being tuned beyond the established high frequency limit.	11, fig. 91
	Sensitive switch	S4	Cam controlled (screwdriver adjust)	Prevents magnetron A from being tuned beyond the established high frequency limit.	10, fig. 91

109 (U). LOPAR Antenna-Receiver-Transmitter Group

The controls and indicators for the LOPAR antenna-receiver-transmitter are located on the electro-mechanical control box, electro-mechanical control panel, acquisition antenna pedestal, acquisition receiver-transmitter, compressor, dehumidifier, modulator control-indicator, acquisition AFC, acquisition RF power supply control, and frequency and power meter. The nonplacarded controls and indicators are shown in figures 94 through 101, and all controls and indicators are discussed in alphabetical order in table 71. Figures 102 and 103 show internal views of the acquisition receiver-transmitter.

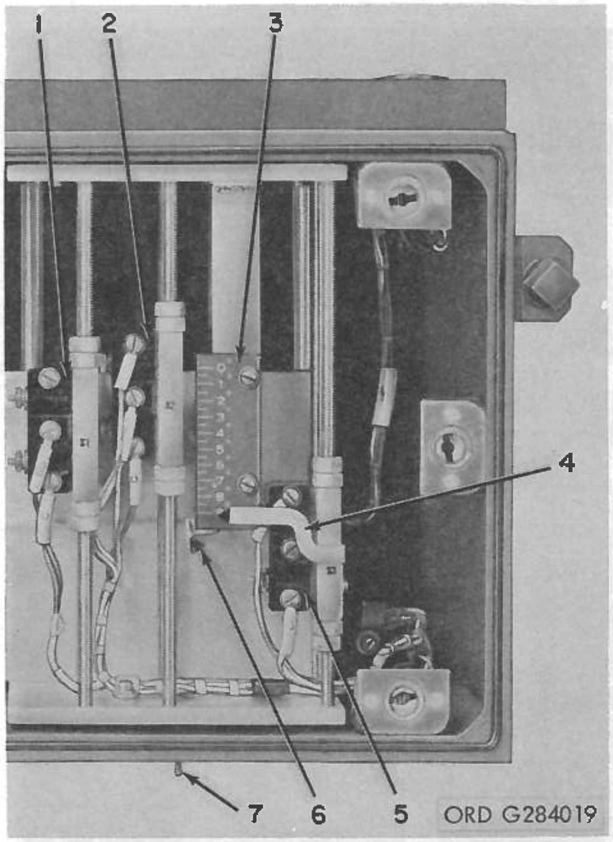


Figure 94 (U). Electro-mechanical control box—nonplacarded controls and indicators (U).

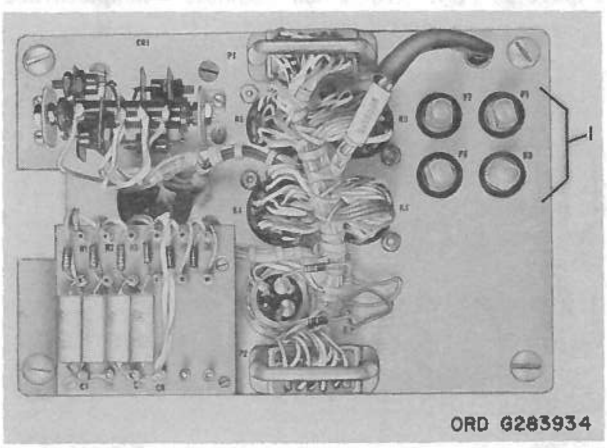


Figure 95 (U). Electro-mechanical control panel—fuse indicators (U).

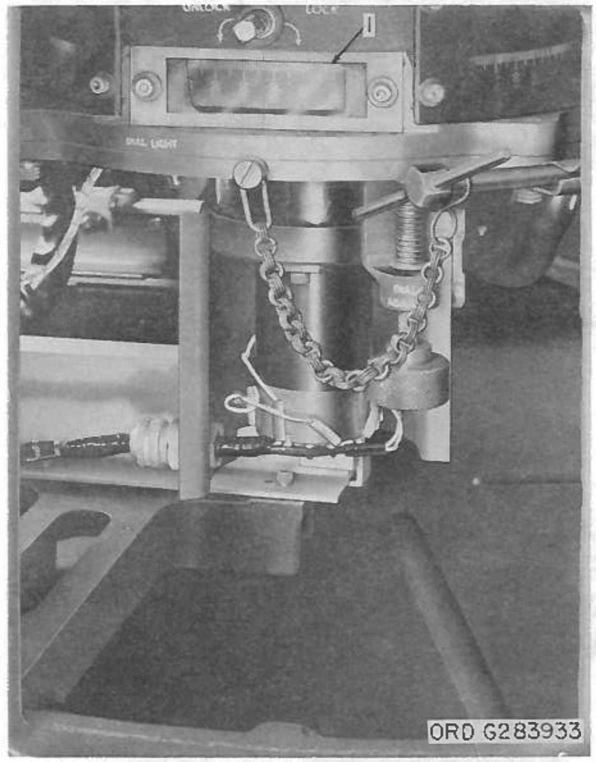


Figure 96 (U). Part of acquisition antenna pedestal—nonplacarded indicator (U).

Figure 97 (U). Compressor—nonplacarded controls (U).

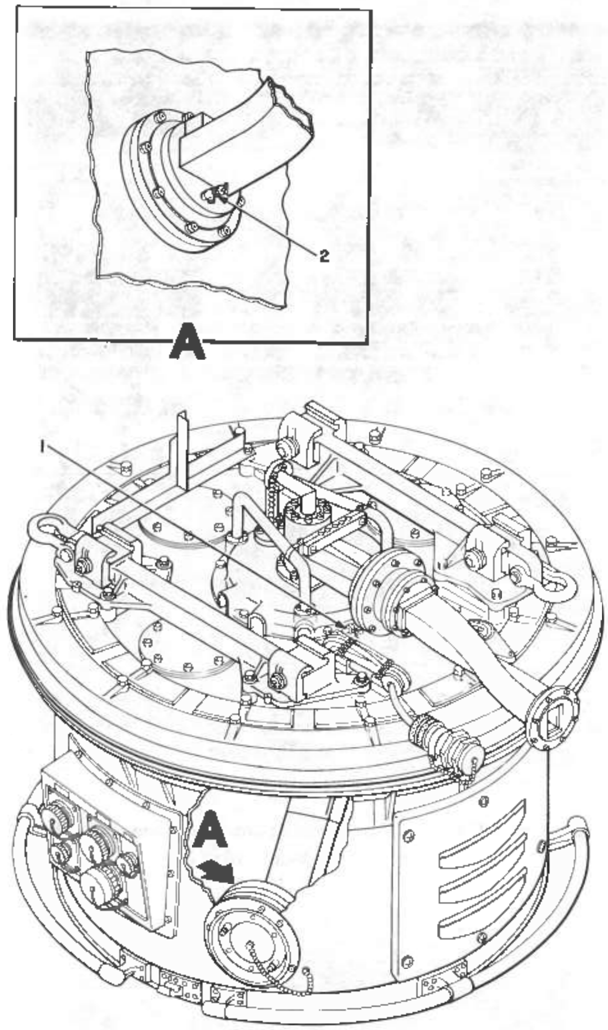


Figure 97.1 (U). Air pressure valves—rotary coupler—typical (U).

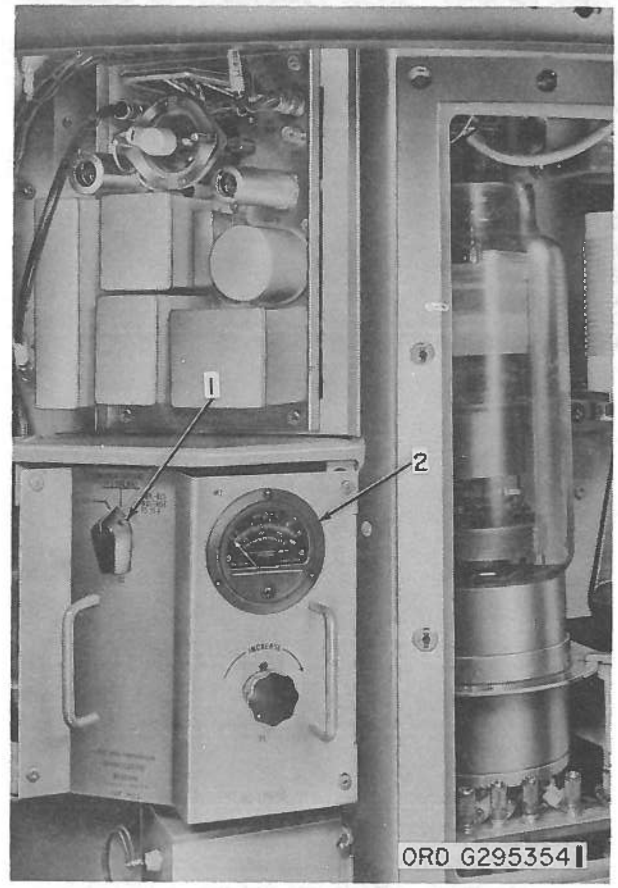


Figure 98 (U). Acquisition modulator—nonplacarded control and indicator (U).

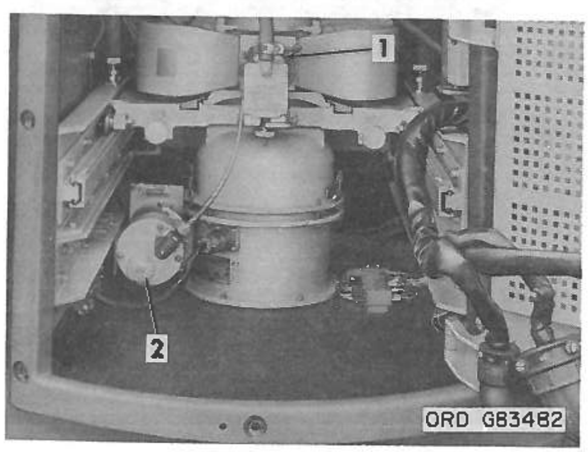


Figure 99 (U). Acquisition receiver-transmitter—partial internal view—nonplacarded controls and indicators (U).

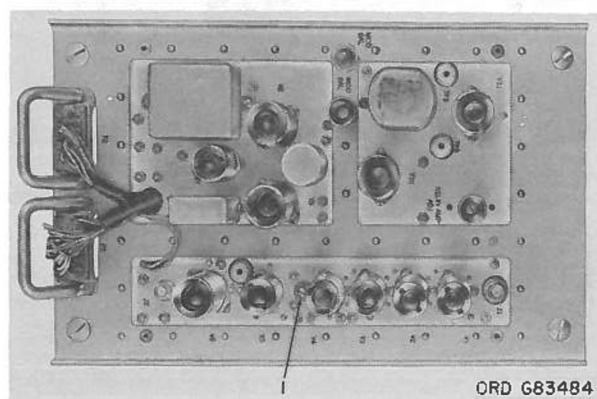


Figure 100 (U). Acquisition AFC—nonplacarded control (U).

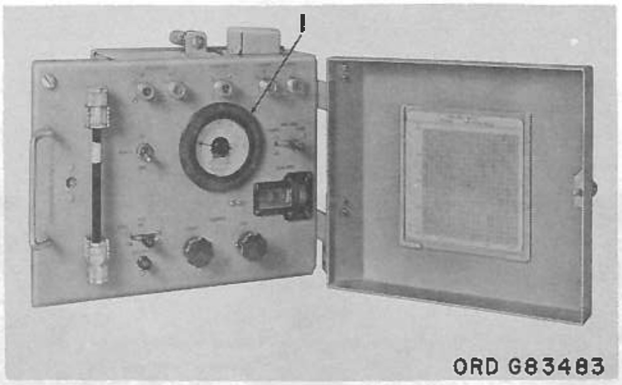


Figure 101 (U). Frequency and power meter—non-placarded indicator (U).

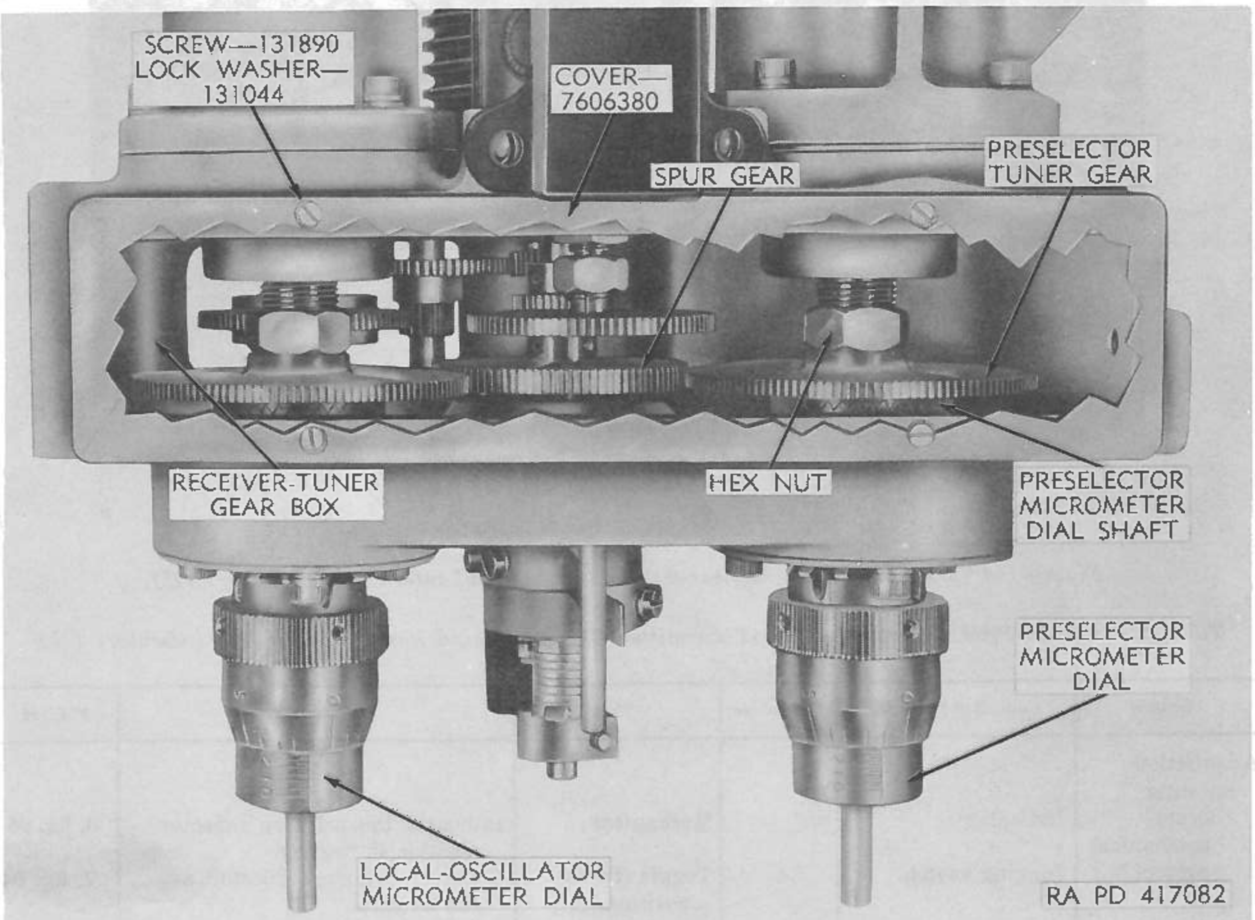


Figure 102 (U). Receiver-tuner—cover removed (U).

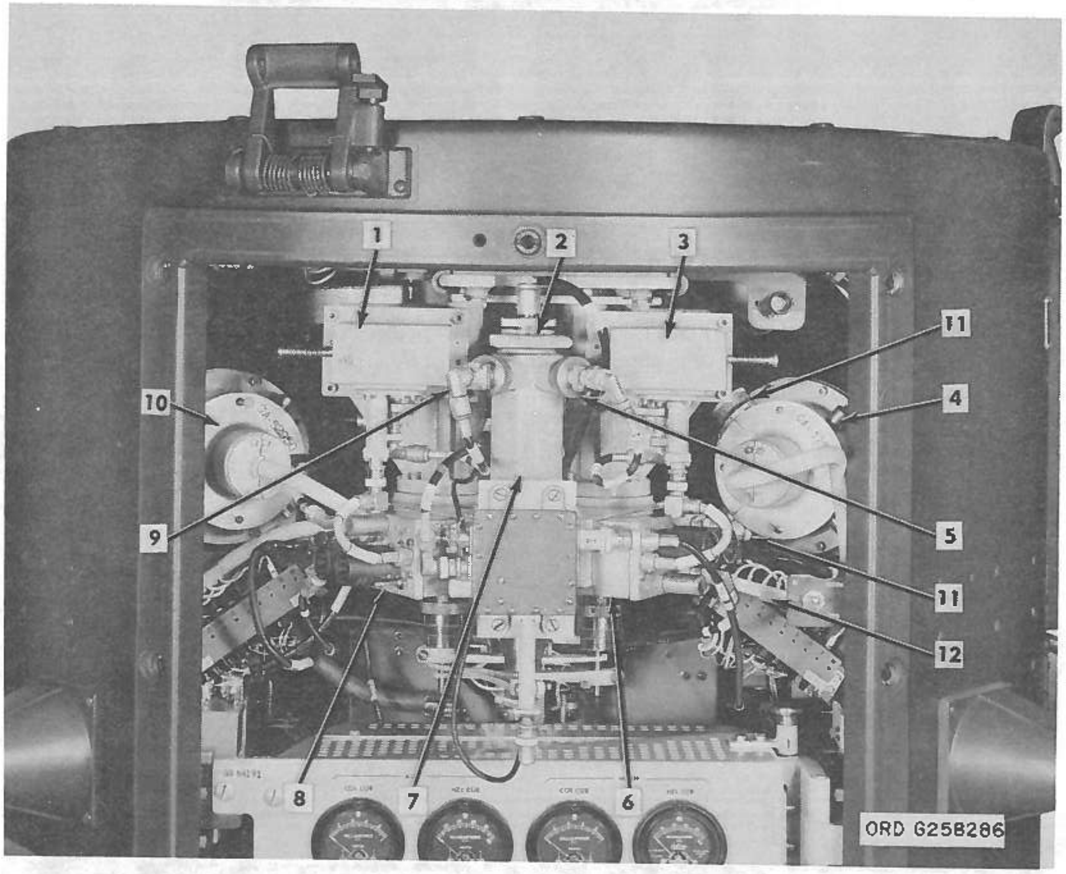


Figure 103 (U). Acquisition receiver-transmitter—partial internal view (upper) (U).

Table 71 (U). LOPAR Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Acquisition antenna Electro-mechanical control box	Indicator		Mechanical	Indicates the primary reflector position in degrees.	6, fig. 94
	Jogging switch	S4	Toggle (three-position, springloaded to center position)	Controls primary reflector at the antenna.	7, fig. 94
	Lower limit switch	S2	Microswitch	Establishes lower limit of antenna scan.	2, fig. 94
	Pointer		Mechanical	Indicates in degrees on scale the operating point of switch S3 and the upper limit of the scan condition.	4, fig. 94

Table 71 (U). LOPAR Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Acquisition antenna—Continued					
Electro-mechanical control box—Continued	Scale		Mechanical	Indicates the vertical scan of antenna, 0 to 9 degrees.	3, fig. 94
	Scan switch	S1	Microswitch	Controls the movement of secondary reflector.	1, fig. 94
	Upper limit switch	S3	Microswitch	Establishes the upper limit of the antenna scan.	5, fig. 94
Electro-mechanical control panel	208-volt fuse indicators	F1, F2, F3, and F4	Clear	Illuminates to indicate associated fuse has blown.	1, fig. 95
Acquisition antenna pedestal	Azimuth dial		Mechanical	Indicates antenna azimuth in mils.	1, fig. 96
	DIAL ADJUST knob		Mechanical (springloaded to down)	Moves azimuth dial.	
	DIAL drive lock		Mechanical	Engages azimuth dial to the dial drive.	
	DIAL LIGHT switch	S2	Toggle (two-position)	Applies power to dial light.	
	HUMIDITY INDICATOR		Desiccant	Indicates amount of moisture in waveguide.	
Compressor	ON—OFF switch	S1	Toggle (two-position)	Applies power to compressor.	
	Power indicator light	I1	Clear	Illuminates when power is applied to compressor.	2, fig. 97
	Pressure meter	M1	Mechanical	Indicates pressure in acquisition antenna rotary joint.	1, fig. 97
Dehumidifier	28VDC—ON indicator light	I2	Clear	Illuminates when 28 volts is applied to dehumidifier.	
	115V-400CY—ON indicator light	I1	Clear	Illuminates when 115 volts is applied to dehumidifier.	
Rotary coupler	Relief valve (upper)		Mechanical	Purges the upper portion of the rotary coupler waveguide assembly.	1, fig. 97.1
	Relief valve (lower)		Mechanical	Purges the lower portion of the rotary coupler waveguide assembly.	2, fig. 97.1
Acquisition modulator					
Modulator control-indicator	INCREASE variable transformer	T1	Rotary (knob adjust)	Adjusts modulator capsule voltage.	
	Meter	M1		Monitors modulator capsule voltage and reverse current diode.	2, fig. 98
	Meter switch	S1	Rotary (three-position)	Selects circuit in modulator to be monitored by meter M1. Positions are OFF, THY-RES VOLTAGE FS10V, and INVERSE CURRENT.	1, fig. 98

Table 71 (U). LOPAR Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Acquisition receiver-transmitter	Magnetron indicator dial		Mechanical	Indicates relative magnetron frequency setting.	1, fig. 99
	Magnetron tuning drive indicator dial		Mechanical	Indicates relative magnetron frequency setting.	2, fig. 99
Acquisition AFC	AFC ERROR SIGNAL variable resistor	R68	Rotary (with lock)	Balances the AFC feedback voltage.	
	MOD BAL switch	S1	Pushbutton	Removes modulator input signals.	
	MOD BAL variable resistor	R43	Rotary with lock (screwdriver adjust)	Balances the AFC with input removed.	
	RELAY AMP ADJ variable resistor	R66	Rotary with lock (screwdriver adjust)	Adjusts threshold voltage to energize hunt relay K1.	
	Variable transformer	T5	Rotary (with lock)	Varies frequency response of coupling network.	1, fig. 100
Acquisition RF power supply control	AUTO FREQ CONTROL—HUNT indicator light	DS3	White	Indicates that AFC is off frequency and that receiver-tuner is searching.	
	AUTO FREQ CONTROL—MOTOR EXC switch	S6	Toggle (two-position)	Applies excitation to receiver-tuner drive.	
	AUTO FREQ CONTROL—RELEASE switch	S4	Pushbutton	Causes AFC receiver-tuner to start searching.	
	AUX RF AMPLIFIER VOLTAGE CONTROLS—COL variable resistor[1]	R52	Rotary with lock (screwdriver adjust)	Adjusts potential on collector of auxiliary traveling-wave tube (TWT).	
	AUX RF AMPLIFIER VOLTAGE CONTROLS—G1 variable resistor[1]	R47	Rotary with lock (screwdriver adjust)	Adjusts negative potential on beam forming electrode of auxiliary TWT.	
	AUX RF AMPLIFIER VOLTAGE CONTROLS—G2 variable resistor[1]	R48	Rotary with lock (screwdriver adjust)	Adjusts potential on anode #1 of auxiliary TWT.	
	AUX RF AMPLIFIER VOLTAGE CONTROLS—G3 variable resistor[1]	R49	Rotary with lock (screwdriver adjust)	Adjusts potential on anode #2 of auxiliary TWT.	

[1]This control or indicator is used only with TWT's with reference number 8516184.

Table 71 (U). LOPAR Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref.
Acquisition antenna—Continued					
Electro-mechanical control box—Continued	Scale		Mechanical	Indicates the vertical scan of antenna, 0 to 9 degrees.	3, fig. 94
	Scan switch	S1	Microswitch	Controls the movement of secondary reflector.	1, fig. 94
	Upper limit switch	S3	Microswitch	Establishes the upper limit of the antenna scan.	5, fig. 94
Electro-mechanical control panel	208-volt fuse indicators	F1, F2, F3, and F4	Clear	Illuminates to indicate associated fuse has blown.	1, fig. 95
Acquisition antenna pedestal	Azimuth dial		Mechanical	Indicates antenna azimuth in mils.	1, fig. 96
	DIAL ADJUST knob		Mechanical (springloaded to down)	Moves azimuth dial.	
	DIAL drive lock		Mechanical	Engages azimuth dial to the dial drive.	
	DIAL LIGHT switch	S2	Toggle (two-position)	Applies power to dial light.	
	HUMIDITY INDICATOR		Desiccant	Indicates amount of moisture in waveguide.	
Compressor	ON—OFF switch	S1	Toggle (two-position)	Applies power to compressor.	
	Power indicator light	I1	Clear	Illuminates when power is applied to compressor.	2, fig. 97
	Pressure meter	M1	Mechanical	Indicates pressure in acquisition antenna rotary joint.	1, fig. 97
Dehumidifier	28VDC—ON indicator light	I2	Clear	Illuminates when 28 volts is applied to dehumidifier.	
	115V–400CY—ON indicator light	I1	Clear	Illuminates when 115 volts is applied to dehumidifier.	
Rotary Coupler	Relief valve (upper)		Mechanical	Purges the upper portion of the rotary coupler waveguide assembly.	1, fig. 97.1
	Relief valve (lower)		Mechanical	Purges the lower portion of the rotary coupler waveguide assembly.	2, fig. 97.1
Acquisition modulator					
Modulator control-indicator	INCREASE variable transformer	T1	Rotary (knob adjust)	Adjusts modulator capsule voltage.	
	Meter	M1		Monitors modulator capsule voltage and reverse current diode.	2, fig. 98
	Meter switch	S1	Rotary (three-position)	Selects circuit in modulator to be monitored by meter M1. Positions are OFF, THY-RES VOLTAGE FS10V, and INVERSE CURRENT.	1, fig. 98

Table 71 (U). LOPAR Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Acquisition receiver-transmitter	Magnetron indicator dial		Mechanical	Indicates relative magnetron frequency setting.	1, fig. 99
	Magnetron tuning drive indicator dial		Mechanical	Indicates relative magnetron frequency setting.	2, fig. 99
Acquisition AFC	MOD BAL switch	S1	Pushbutton	Removes modulator input signals.	
	MOD BAL variable resistor	R43	Rotary with lock (screwdriver adjust)	Balances the AFC with input removed.	
	RELAY AMP ADJ variable resistor	R66	Rotary with lock (screwdriver adjust)	Adjusts threshold voltage to energize hunt relay K1.	
	Variable transformer	T5	Rotary (with lock)	Varies frequency response of coupling network.	1, fig. 100
Acquisition RF power supply control	AUTO FREQ CONTROL—HUNT indicator light	DS3	White	Indicates that AFC is off frequency and that receiver tuner is searching.	
	AUTO FREQ CONTROL—MOTOR EXC switch	S6	Toggle (two-position)	Applies excitation to receiver tuner drive.	
	AUTO FREQ CONTROL—RELEASE switch	S4	Pushbutton	Causes AFC receiver-tuner to start searching.	
	AUX RF AMPLIFIER VOLTAGE CONTROLS—COL variable resistor	R52	Rotary with lock (screwdriver adjust)	Adjusts potential on collector of auxiliary traveling-wave tube (TWT).	
	AUX RF AMPLIFIER VOLTAGE CONTROLS—G1 variable resistor	R47	Rotary with lock (screwdriver adjust)	Adjusts negative potential on beam forming electrode of auxiliary TWT.	
	AUX RF AMPLIFIER VOLTAGE CONTROLS—G2 variable resistor	R48	Rotary with lock (screwdriver adjust)	Adjusts potential on anode #1 of auxiliary TWT.	
	AUX RF AMPLIFIER VOLTAGE CONTROLS—G3 variable resistor	R49	Rotary with lock (screwdriver adjust)	Adjusts potential on anode #2 of auxiliary TWT.	

Table 71 (U). LOPAR Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Acquisition receiver-transmitter—Continued					
Acquisition RF power supply control—Continued	AUX RF AMPLIFIER VOLTAGE CONTROLS—G4 variable resistor[1]	R50	Rotary with lock (screwdriver adjust)	Adjusts potential on anode #3 of auxiliary TWT.	
	AUX RF AMPLIFIER VOLTAGE CONTROLS—HEL variable resistor[1]	R51	Rotary with lock (screwdriver adjust)	Adjusts potential on helix of auxiliary TWT.	
	AUX—COL CUR meter[1]	M7		Indicates collector current of auxiliary TWT.	
	AUX—HEL CUR meter[1]	M6		Indicates helix current of auxiliary TWT.	
	IF GAIN switch	S3	Toggle (two-position)	Transfers receiver gain control from battery control console to antenna.	
	IF GAIN variable resistor	R8	Rotary (knob adjust)	Controls receiver gain at the antenna.	
	LOCAL OSC CONTROLS—LEVEL variable resistors	R21 A & B	Rotary with lock (screwdriver adjust)	Adjusts the voltage level over which the local oscillator potential may vary.	
	LOCAL OSC CONTROLS—SPREAD variable resistors	R24 A & B	Rotary with lock (screwdriver adjust)	Adjusts the limits over which local oscillator repeller voltage may vary.	
	MAG FREQ switch	S2	Toggle (three-position, springloaded to center)	Decreases frequency of magnetron when set to LOWER and increases magnetron frequency when set to RAISE.	
	MAIN—COL CUR meter[1]	M3		Indicates collector current of main TWT.	
	MAIN—HEL CUR meter[1]	M2		Indicates helix current of main TWT.	
	MAIN RF AMPLIFIER VOLTAGE CONTROLS—COL variable resistor[1]	R19	Rotary with lock (screwdriver adjust)	Adjusts potential on collector of main TWT.	
	MAIN RF AMPLIFIER VOLTAGE CONTROLS—G1 variable resistor[1]	R11	Rotary with lock (screwdriver adjust)	Adjusts negative potential on beam forming electrode of main TWT.	
	MAIN RF AMPLIFIER VOLTAGE CONTROLS—G2 variable resistor[1]	R14	Rotary with lock (screwdriver adjust)	Adjusts potential on anode #1 of main TWT.	

[1] This control or indicator is used only with TWT's with reference number 8516184.

Table 71 (U). LOPAR Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Acquisition receiver-transmitter —Continued					
Acquisition RF power supply control—Continued	MAIN RF AMPLIFIER VOLTAGE CONTROLS—G3 variable resistor[1]	R13	Rotary with lock (screwdriver adjust)	Adjusts potential on anode #2 of main TWT.	
	MAIN RF AMPLIFIER VOLTAGE CONTROLS—G4 variable resistor[1]	R16	Rotary with lock (screwdriver adjust)	Adjusts potential on anode #3 of main TWT.	
	MAIN RF AMPLIFIER VOLTAGE CONTROLS—HEL variable resistor[1]	R18	Rotary with lock (screwdriver adjust)	Adjusts potential on helix of main TWT.	
	NOISE GEN—EXC switch	S1	Pushbutton	Energizes noise generator.	
	NOISE GEN—GEN ON indicator light	DS2	Green	Indicates EXC switch has been depressed and noise generator is energized.	
	NOISE GEN—HV ON indicator light	DS1	Red	Indicates noise generator is energized from the battery control console.	
	RCVR TEST switch	S9	Rotary (two-position)	Selects either main or auxiliary channel to be monitored by TEST 2 meter.	
	TEST 1 meter	M5		Indicates potentials designated by TEST 1 switch.	
	TEST 2 meter	M4		Indicates potential designated at each position of TEST 2 switch.	
	TEST 1 switch	S8	Rotary (seven-position)	TEST 1 meter monitors the current and voltages as specified for each switch position.	
	TEST 2 switch	S7	Rotary (12-position)	TEST 2 meter monitors the voltages as specified for each switch position.	
Frequency and power meter	BALANCE—COARSE variable resistor	R6	Rotary (knob adjust)	Balances frequency and power meter movement.	
	BALANCE—FINE variable resistor	R7	Rotary (knob adjust)	Balances frequency and power meter movement.	
	GALV SENS switch	S1	Pushbutton	Increases meter movement sensitivity.	

[1]This control or indicator is used only with TWT's with reference number 8516184.

Table 71 (U). LOPAR Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Acquisition receiver-transmitter—Continued					
Acquisition RF power supply control—Continued	AUX RF AMPLIFIER VOLTAGE CONTROLS—G4 variable resistor	R50	Rotary with lock (screwdriver adjust)	Adjusts potential on anode #3 of auxiliary TWT.	
	AUX RF AMPLIFIER VOLTAGE CONTROLS—HEL variable resistor	R51	Rotary with lock (screwdriver adjust)	Adjusts potential on helix of auxiliary TWT.	
	AUX—COL CUR meter	M7		Indicates collector current of auxiliary TWT.	
	AUX—HEL CUR meter	M6		Indicates helix current of auxiliary TWT.	
	IF GAIN switch	S3	Toggle (two-position)	Transfers receiver gain control from battery control console to antenna.	
	IF GAIN variable resistor	R8	Rotary (knob adjust)	Controls receiver gain at the antenna.	
	LOCAL OSC CONTROLS—LEVEL variable resistors	R21 A & B	Rotary with lock (screwdriver adjust)	Adjusts the voltage level over which the local oscillator potential may vary.	
	LOCAL OSC CONTROLS—SPREAD variable resistors	R24 A & B	Rotary with lock (screwdriver adjust)	Adjusts the limits over which local oscillator repeller voltage may vary.	
	MAG FREQ switch	S2	Toggle (three-position, springloaded to center)	Decreases frequency of magnetron when set to LOWER and increases magnetron frequency when set to RAISE.	
	MAIN—COL CUR meter	M3		Indicates collector current of main TWT.	
	MAIN—HEL CUR meter	M2		Indicates helix current of main TWT.	
	MAIN RF AMPLIFIER VOLTAGE CONTROLS—COL variable resistor	R19	Rotary with lock (screwdriver adjust)	Adjusts potential on collector of main TWT.	
	MAIN RF AMPLIFIER VOLTAGE CONTROLS—G1 variable resistor	R11	Rotary with lock (screwdriver adjust)	Adjusts negative potential on beam forming electrode of main TWT.	
	MAIN RF AMPLIFIER VOLTAGE CONTROLS—G2 variable resistor	R14	Rotary with lock (screwdriver adjust)	Adjusts potential on anode #1 of main TWT.	

Table 71 (U). LOPAR Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Acquisition receiver-transmitter—Continued					
Acquisition RF power supply control—Continued	MAIN RF AMPLIFIER VOLTAGE CONTROLS—G3 variable resistor	R13	Rotary with lock (screwdriver adjust)	Adjusts potential on anode #2 of main TWT.	
	MAIN RF AMPLIFIER VOLTAGE CONTROLS—G4 variable resistor	R16	Rotary with lock (screwdriver adjust)	Adjusts potential on anode #3 of main TWT.	
	MAIN RF AMPLIFIER VOLTAGE CONTROLS—HEL variable resistor	R18	Rotary with lock (screwdriver adjust)	Adjusts potential on helix of main TWT.	
	NOISE GEN—EXC switch	S1	Pushbutton	Energizes noise generator.	
	NOISE GEN—GEN ON indicator light	DS2	Green	Indicates EXC switch has been depressed and noise generator is energized.	
	NOISE GEN—HV ON indicator light	DS1	Red	Indicates noise generator is energized from the battery control console.	
	RCVR TEST switch	S9	Rotary (two-position)	Selects either main or auxiliary channel to be monitored by TEST 2 meter.	
	TEST 1 meter	M5		Indicates potentials designated by TEST 1 switch.	
	TEST 2 meter	M4		Indicates potential designated at each position of TEST 2 switch.	
	TEST 1 switch	S8	Toggle (seven-position)	TEST 1 meter monitors the current and voltages as specified for each switch position.	
	TEST 2 switch	S7	Toggle (12-position)	TEST 2 meter monitors the voltages as specified for each switch position.	
Frequency and power meter	BALANCE—COARSE variable resistor	R6	Rotary (knob adjust)	Balances frequency and power meter movement.	
	BALANCE—FINE variable resistor	R7	Rotary (knob adjust)	Balances frequency and power meter movement.	
	GALV SENS switch	S1	Pushbutton	Increases meter movement sensitivity.	

Table 71 (U). LOPAR Antenna-Receiver-Transmitter Group—Behind Panel Controls and Indicators—Continued *(U)*

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
Acquisition receiver-transmitter—Continued					
Frequency and power meter—Continued	MAG FREQ switch	S3	Toggle (three-position, springloaded to center)	Varies magnetron operating frequency.	
	MEAS FREQ dial		Mechanical	Measures input frequency by varying cavity to resonance.	
	MEAS FREQ knob		Knurled	Varies the cavity in the frequency and power meter and positions associated dial.	
	Meter	M1		Indicates average power in increments of 1 ma.	1, fig. 101
	POWER switch	S4	Toggle (two-position)	Applies power to frequency and power meter.	
	TEST switch	S2	Toggle (two-position)	Switches meter input from power measurement to calibration.	

110 (U). Radar Test Set and RF Detector

The controls for the radar test set and RF detector are described in table 72.

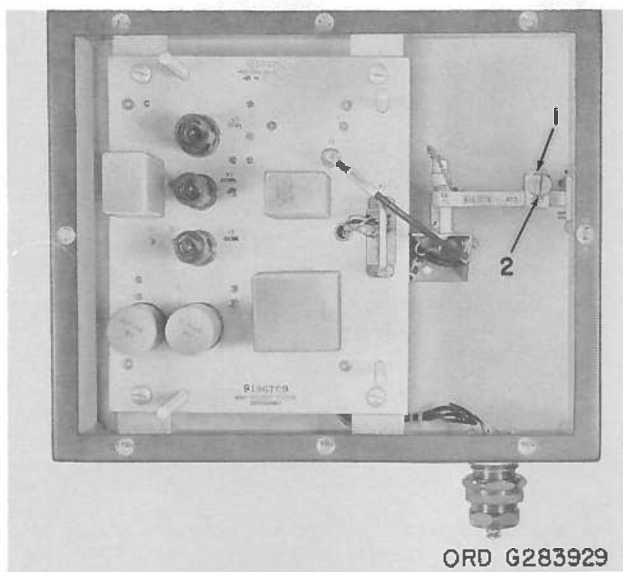


Figure 104 (U). RF detector—nonplacarded control (U).

Table 72 (U). Radar Test Set and RF Detector—Behind Panel Controls (U)

Chassis	Control or indicator	Appar des	Type	Function	Fig. ref
RF detector	Variable attenuator	AT1	Screw (knurled)	Determines amount of RF energy from the target ranging radar transmitter that is detected. *Note.* In order to adjust AT1 it is necessary to loosen knurled locking screw (1, fig. 104).	2, fig. 104
Test set subassembly	HERC—HERC IMPR SYSTEM	S2	Toggle (two-position)	Conditions the radar test set for use with a NIKE-HERCULES System or Improved NIKE-HERCULES System.	

CHAPTER 7 (C)

FUNCTIONAL OPERATION AND DESCRIPTION OF INDICATOR PRESENTATIONS OF THE RADAR COURSE DIRECTING CENTRAL

Section I (U). INTRODUCTION

111 (U). General

This chapter describes the functional operation and description of the indicator presentations in the Improved NIKE-HERCULES System. The controls that affect or control these presentations are also discussed. To utilize the electronic counter-countermeasure (ECCM) features of the Improved NIKE-HERCULES System, refer to TM 9-1430-250-10/3. The Improved NIKE-HERCULES RCDC can operate with or without a High Power Acquisition Radar (HIPAR) or an Auxiliary Acquisition Radar (AAR). This chapter describes the operation and presentations in the RCDC for systems with and without a HIPAR/AAR. When a HIPAR/AAR is integrated as part of the Improved NIKE-HERCULES RCDC, an additional source of video is made available for use in the presentation system. Since the HIPAR system operates in the L band and the LOPAR system operates in the S band, the two radars may be in operation simultaneously without interference from one another. However, acquisition video for the presentation system can be selected from only one of the radar receivers at a time.

Section II (C). ACQUISITION RADAR SYSTEMS (HIPAR AND LOPAR) PRESENTATIONS AND CONTROLS

112 (C). Radar Select Control

The Improved NIKE-HERCULES System employs two acquisition radars to supply acquisition video to the presentation system of the trailer mounted director station. Selection of either radar is controlled by the RADAR SELECT switch. When the RADAR SELECT switch is set to LOPAR, the LOPAR SELECTED indicator light illuminates, and LOPAR video is supplied to the presentation system and displayed on the PPI. The maximum operational range of the LOPAR system is 250,000 yards. When the RADAR SELECT switch is set to HIPAR/AAR, the HIPAR/AAR SELECTED indicator light illuminates and HIPAR/AAR video is supplied to the presentation system and displayed on the PPI on the battery control console. The maximum operational range of the HIPAR/AAR system is 350,000 yards.

113 (U). LOPAR Equipment Control

The operation of the LOPAR system is controlled by operating various groups of controls where each group is related to a control function. Each of the control functions is discussed below. To utilize the electronic counter-countermeasure (ECCM) features of the LOPAR system, refer to TM 9-1430-250-10/3.

a. Antenna Control. Control of the LOPAR antenna involves establishing the desired azimuth rotational speed and pointing angle. The antenna disable switch on the acquisition antenna pedestal, the BARBETTE AC power switch on the acquisition power control panel, the ANT RPM switch, the DOWN/SCAN-UP switch and the ANT ELEV indicator on the LOPAR control-indicator are used in performing these operations.

b. Antenna Disable Switch and ANT RPM Switch. When the antenna disable switch (table 47, par. 90*a*(1)) is set to ON, the azimuth rotational speed of the acquisition antenna (LOPAR) is controlled by the ANT RPM switch, provided the BARBETTE AC POWER switch is set to ON. When the antenna disable switch is set to either center or OFF, the ac-

quisition antenna (LOPAR) can only be rotated manually in azimuth. When the ANT RPM switch is set to OFF, the acquisition antenna can only be rotated manually in azimuth. When the switch is set to 5, 10, or 15 the acquisition antenna (LOPAR) rotates at speeds of 5, 10, and 15 rpm, respectively.

c. DOWN/SCAN–UP Switch and ANT ELEV Indicator. The elevation angle of the LOPAR transmitted beam is controlled by the DOWN/SCAN–UP switch as indicated on the ANT ELEV indicator. When the DOWN/SCAN–UP switch is operated to UP, the LOPAR transmitted beam increases in elevation until it reaches an angular position of 400 mils. The beam remains at this position until the DOWN/SCAN–UP switch is set to DOWN/SCAN, decreasing the beam angle to a minimum of 0 mils (lower limit of the transmitted beam). If the switch remains in the DOWN/SCAN position, the beam automatically scans between 35 mils and an upper limit, determined by the prevailing scan condition. The prevailing scan condition determines the elevation at which the pencil-shaped transmitted beam changes to the cosecant-squared beam. The adjustments for the scan condition are made at the LOPAR antenna-receiver-transmitter group in accordance with the procedures prescribed in TM 9–1430–251–20/2. The four scan conditions are described in paragraph 67. When the switch is released from UP or set to the center from DOWN/SCAN, the LOPAR transmitter beam remains at the elevation angle indicated on the ANT ELEV indicator.

114 (U). Magnetron Frequency Control

Note. If magnetron frequency is changed when the magnetron is operating, it may be necessary to rotate the magnetron HV SUPPLY knob on the LOPAR auxiliary control-indicator to maintain the proper magnetron current of 30 ma on the magnetron meter.

Magnetron frequency control involves establishing the desired operating frequency of the magnetron associated with the LOPAR transmitter system. The MAG FREQ switch and the MAG FREQ meter on the LOPAR control-indicator are used to establish the operating frequency. For a discussion of these controls, refer to table 17, paragraph 81*i*. When the magnetron is functioning properly at a current of 30 ma, the LOPAR POWER indicator light illuminates (amber). Flickering of this light indicates arcing within the magnetron or waveguide. When this occurs, rotate HV SUPPLY knob on the LOPAR auxiliary control-indicator counterclockwise until arcing ceases.

Caution: **If flickering of the LOPAR POWER indicator light continues, turn the HV SUPPLY knob to START.**

115 (U). Automatic Frequency Control (AFC)

Control of the intermediate frequency (IF) of the receiver system in the LOPAR system is automatic; however, certain observations must be made by the operator to insure that the IF is correct. Also, certain operations must be performed by the operator to maintain the proper frequency in the event the IF is incorrect. These operations are discussed in *a* and *b* below.

a. The AFC circuits normally automatically lock on the correct IF (60 mc above the LOPAR magnetron frequency). During normal operation, the AFC RELEASE indicator on the LOPAR control-indicator indicates the condition of the acquisition AFC circuit as explained in (1) through (3) below.

(1) A steady glow of the AFC RELEASE indicator indicates that the acquisition AFC circuit is not locked on the correct IF, and indicates that the AFC circuit is searching for the proper IF.

(2) An occasional flickering or extinguished AFC RELEASE indicator accompanied by video on the PPI indicates that the acquisition AFC circuit is locked on the correct IF.

(3) A flickering AFC RELEASE indicator and reduced or no video on the PPI indicates that the AFC circuit is locked ON an erroneous frequency, 60 mc below the LOPAR magnetron frequency.

b. If the AFC circuit locks on an incorrect frequency, as explained in *a*(3) above, a search

cycle can be started by depressing and holding the AFC switch for 5 seconds. This causes the AFC circuit to automatically search throughout its frequency range (3,160 to 3,560 mc). The AFC circuit then acquires and locks on the correct IF.

116 (U). Acquisition High Voltage Control

Acquisition high voltage control involves observations and operations necessary to control magnetron high voltage of the LOPAR system and indicator high voltage of the presentation system of the trailer mounted director station. Indicator high voltage control and magnetron high voltage control are given in *a* and *b* below.

a. Indicator High Voltage Control. When the INDICATOR HV switch on the LOPAR auxiliary control-indicator is set to ON, the INDICATOR HV—ON indicator light is illuminated, and high voltage is applied to the PPI (13, fig. 22) and the precision indicator (15, fig. 22). This causes the cathode-ray tubes of the PPI and precision indicator to illuminate, provided the ANT RPM on the LOPAR control indicator is set to 5, 10, or 15 and the INTENSITY knobs on the PPI and on the precision indicator are properly adjusted.

Caution: **Safety devices are built into the magnetron high voltage circuits to insure proper energizing, but these safety devices may fail; therefore, to prevent damage to or possible failure of the equipment, energize the LOPAR system equipment in the manner prescribed in tables 73 and 74.**

b. Magnetron High Voltage Control. When the HV SUPPLY—READY indicator light on the LOPAR auxiliary control-indicator illuminates, the necessary time delay has elapsed and high voltage can be applied to the magnetron of the LOPAR system. Prior to depressing the HV SUPPLY—ON switch the HV SUPPLY knob must be turned fully counterclockwise to START. When the HV SUPPLY—ON switch is depressed, the HV SUPPLY—ON indicator light illuminates and the HV SUPPLY—READY indicator light extinguishes. After the magnetron is energized, the current of the LOPAR magnetron is controlled by the HV SUPPLY knob. The HV SUPPLY knob is rotated clockwise until the pointer on the MAGNETRON meter indicates a LOPAR magnetron current of 30 ma. When the pointer reaches a current of 30 ma, the LOPAR POWER indicator light on the LOPAR control-indicator is illuminated. The pointer on the MAGNETRON meter may fluctuate, indicating arcing within the magnetron. When this occurs, the HV SUPPLY knob should be turned counterclockwise until the arcing ceases.

Caution: **If the pointer of the MAGNETRON meter continues to fluctuate, turn the HV SUPPLY knob counterclockwise to START.**

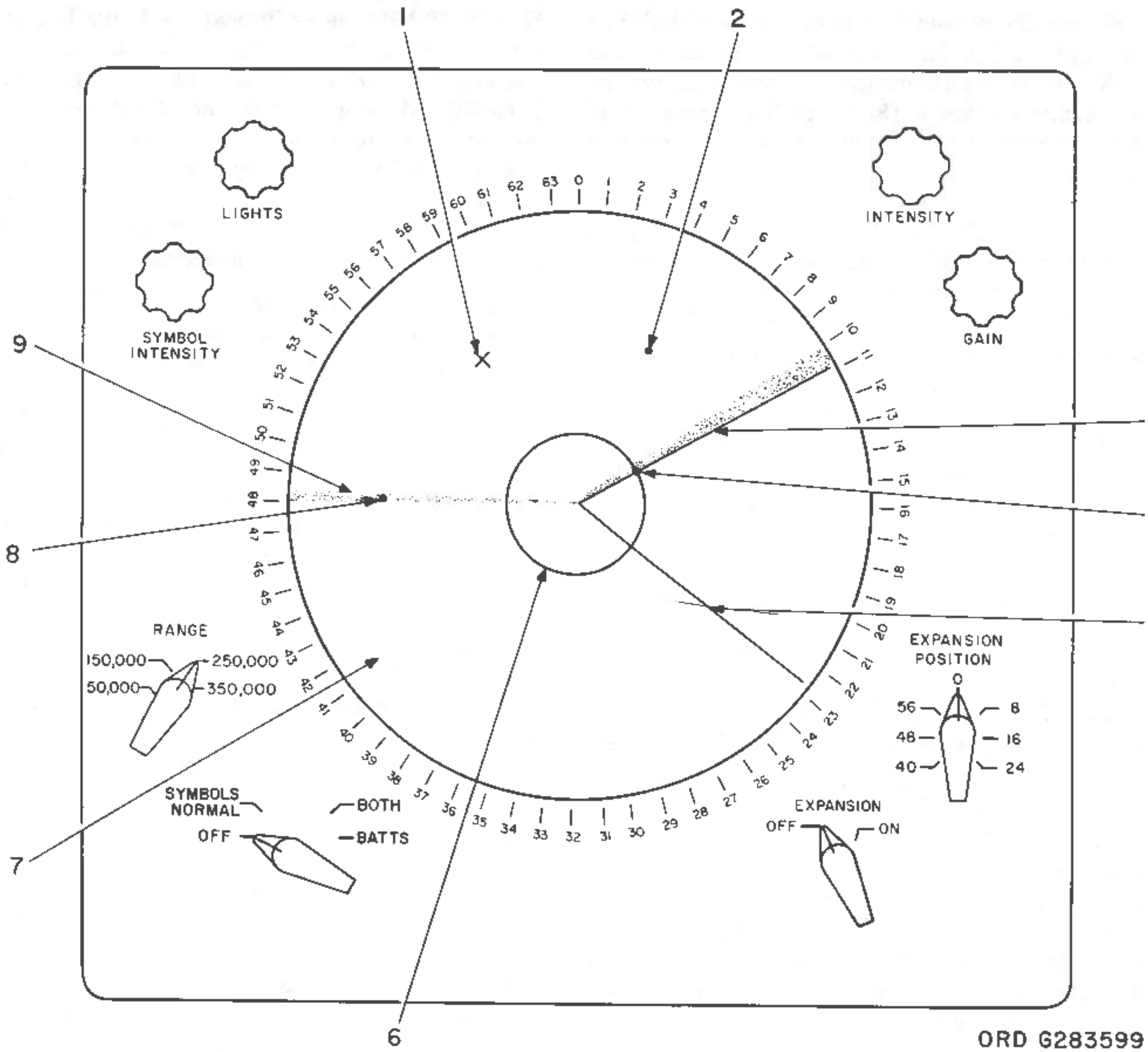
To deenergize the LOPAR magnetron, turn the HV SUPPLY knob counterclockwise to START. The LOPAR POWER indicator light extinguishes as the MAGNETRON meter pointer indicates a magnetron current of less than 23 ma. When the HV SUPPLY knob is turned to START and the HV SUPPLY—OFF switch is depressed, the HV SUPPLY—ON indicator light extinguishes and the HV SUPPLY—READY indicator light illuminates. The LOPAR magnetron is now deenergized.

117 (C). LOPAR Presentation

a. Basic Presentations with RADAR SELECT Switch set to LOPAR. The basic PPI presentations, when LOPAR video is selected, are nonjamming target video, jamming target video (ECM), and reference marks. The basic target video, reference marks and ECM effects appearing on the cathode-ray tube are shown in figure 105 and discussed in (1) below. The operational use of these reference marks and the controls affecting them are explained in (2) below.

Note. The key numbers shown in parentheses in (1) and (2) below refer to figure 105 unless otherwise indicated.

(1) The basic PPI presentation, with the RADAR SELECT switch set to LOPAR that is displayed on the cathode-ray tube (7), consists of a nonjamming target video (2), jamming target video (8) and jam strobe (9), when present, and the following reference marks: a rotating radial sweep (3), an acquisition range circle (6), an electronic (track) cross (1), an acquisition (flashing) azimuth line



1—Electron (track) cross
2—Non-jamming target video
3—Rotating radial sweep
4—Acquisition range mark
5—Acquisition (flashing) azimuth line
6—Acquisition range circle
7—Cathode-ray tube
8—Jamming target video
9—Jam strobe

Figure 105 (C). Basic PPI presentation (U).

(5), and an acquisition range mark (4).

(*a*) *Acquisition range circle and acquisition range mark.* The acquisition range circle (6) appears as a result of the acquisition range mark (4). The acquisition range mark is superimposed on the rotating radial sweep (3) and "paints" a circle on the PPI as it rotates in synchronism with the acquisition antenna. The acquisition range circle is adjusted to represent ranges from 0 to 250,000 yards depending upon the setting of the RANGE switch on the PPI. When the range circle is adjusted to coincide with the target video (2 and 8) the position of the

acquisition range circle represents the slant range to the target, as indicated by the RANGE dial on the target designate control-indicator.

(*b*) *Acquisition (flashing) azimuth line.* The acquisition (flashing) azimuth line (5) appears as a brightened stationary radial line once during each revolution of the rotating radial sweep (3). When the line is adjusted to coincide with the target video it represents a coarse indication of the azimuth of the target. The acquisition (flashing) azimuth line (5) may be steered to indicate any azimuth on the face of the PPI. When the azimuth switch is depressed, all displays are blanked out on the PPI, except the acquisition (steerable) azimuth line (1, fig. 106) and the acquisition range mark (2, fig. 106). The line and mark appear as a continuous display and are not illuminated by the rotating radial sweep (3). When the azimuth knobs (fine and coarse) are rotated the acquisition (steerable) azimuth line is positioned in azimuth to coincide with the azimuth of the target video.

(*c*) *Rotating radial sweep.* The rotating radial sweep (3) extends from the center to the outer edge of the cathode-ray tube (7), provided the EXPANSION switch is set to OFF. The sweep rotates clockwise around the cathode-ray tube in synchronism with the rotation of the acquisition antenna (HIPAR or LOPAR). Once during each revolution, the sweep brightens all displays on the cathode-ray tube as the sweep coincides with each display.

(*d*) *Target video.* Target video becomes a part of the basic presentation when either the LOPAR or HIPAR system is operating and a target is present within the defended area. The target video appears as a bright spot with each rotation of the rotating radial sweep (3). The intensity of the spot or arc depends upon the magnitude of the radar return signals from the target. Different types of target video (2 and 8) may be seen on the PPI. A jamming target may or may not appear in the jam strobe. This depends on the output power of the jammer and the magnitude of the reflected signal from the target.

(*e*) *Electronic (track) cross.* The electronic (track) cross (1) appears once during each revolution of the rotating radial sweep when the sweep is coincident with the azimuth and range settings of the target tracking radar system.

(*f*) *Jam strobe.* The jam strobe (9) will be displayed if CW or noise jamming is present. The jam strobe appears at azimuth of an individual jamming target. If the jamming target is obscured in the strobe and is the target to be engaged, only azimuth information is transmitted to the TTR during the designate phase of operation.

(*g*) *Chaff cloud or clutter.* A chaff cloud or clutter will be displayed on the PPI, but due to the AJD capability of the LOPAR system, this effect will be greatly reduced.

(2) The target video and the five reference marks described in (1) above are affected or controlled by the controls listed in (*a*) through (*g*) below and are explained in the applicable table.

(*a*) LIGHTS knob (table 14).

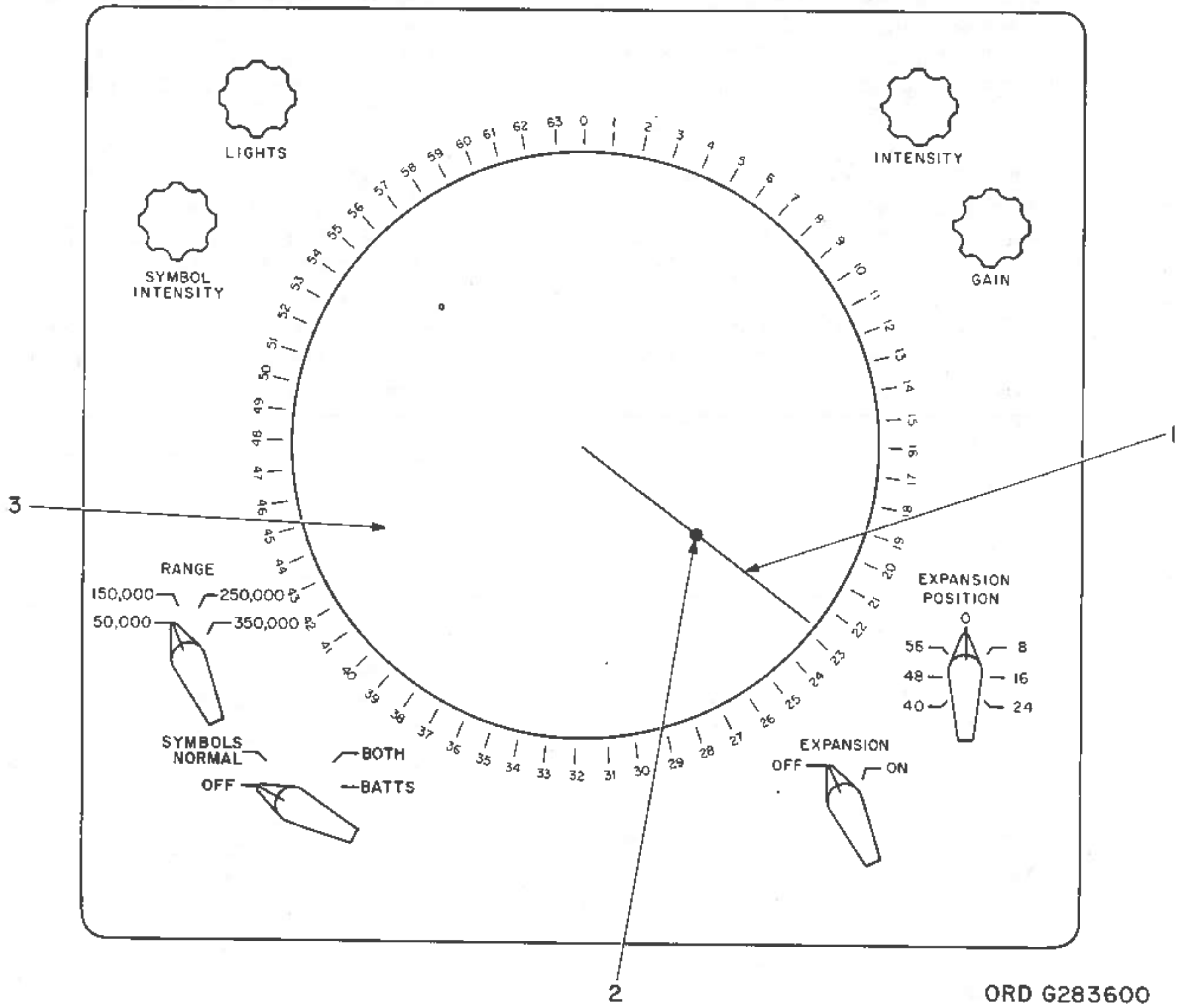
(*b*) INTENSITY, GAIN, SYMBOL INTENSITY knobs (table 14).

(*c*) EXPANSION, RANGE and SYMBOLS switches (table 14).

(*d*) Range handwheel, range SLEW switch, range MAN-AID switch and RANGE dial (table 13).

(*e*) Azimuth switch and azimuth knobs (table 13).

(*f*) MTI switch and MTI SECTOR ANGLE knob (tables 17 and 20).



1—Steerable azimuth line 2—Acquisition range mark 3—Cathode-ray tube

Figure 106 (C). PPI presentation—steerable azimuth line present (U).

(*g*) REC GAIN knob, STC knob, PROC-IS switch and AJD ONLY switch (table 17).

Note. The key numbers shown in parentheses in *b* below refer to figure 107 unless otherwise indicated.

b. Precision Indicator Basic Presentation. The basic precision indicator presentation (fig. 107) appears on the cathode-ray tube as an expanded portion of the basic PPI presentation (fig. 105). This portion represents 25,000 yards in range and 30 degrees (or approximately 500 mils) in azimuth; centered about the intersection of the fixed acquisition range line (6) and the fixed acquisition azimuth line (5). The precision indicator presentation consists of target video (4) and the following reference marks: an electronic sweep (3), a fixed acquisition azimuth line (5), a fixed acquisition range line (6), and an electronic (track) cross (2). The target video and four reference marks shown in figure 107 are discussed in (1) through (5) below.

(1) *Electronic sweep.* The electronic sweep (3) is a vertical line that moves from left to right in synchronism with the rotation of the acquisition antenna

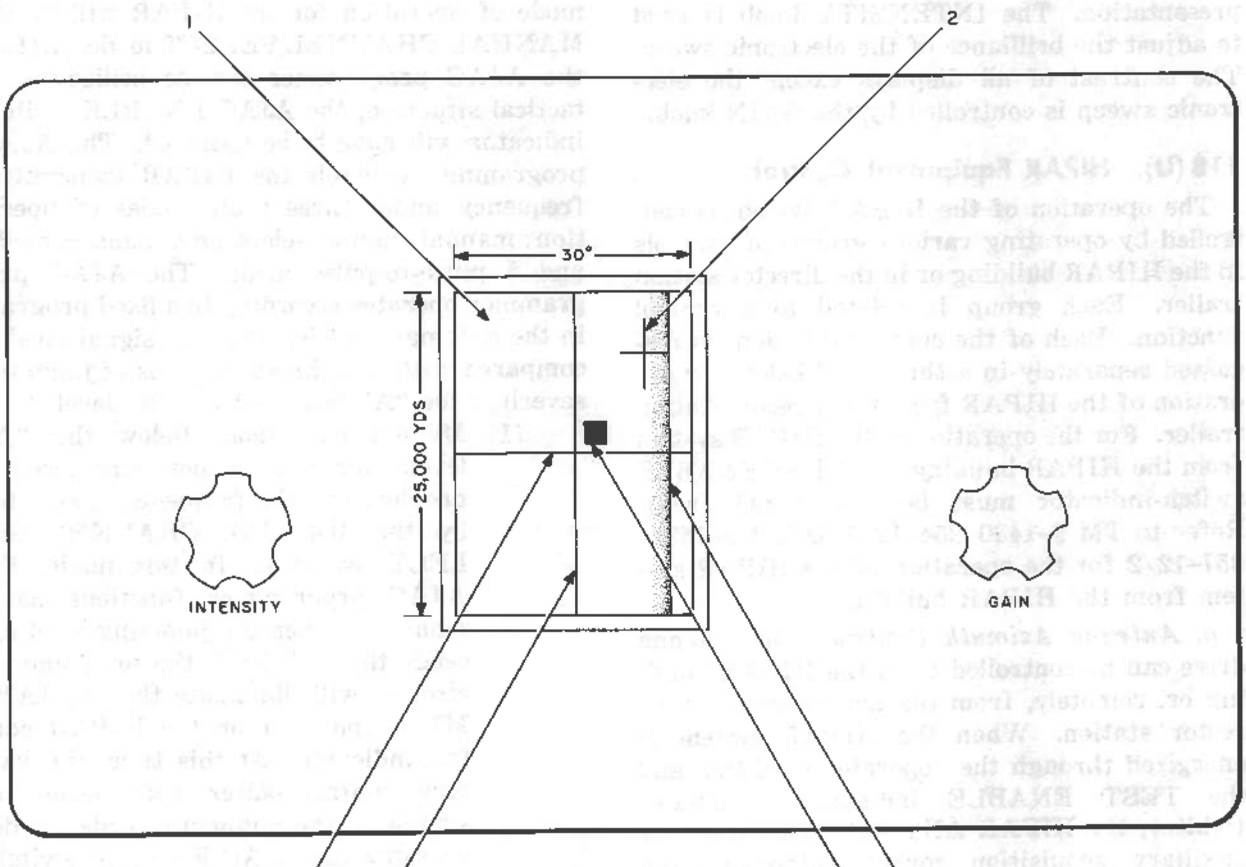
(LOPAR) (fig. 40). Once during each revolution, the sweep brightens all displays on the cathode-ray tube (1) as the sweep coincides with each display.

(2) *Fixed acquisition azimuth line.* The fixed acquisition azimuth line (5) is a black vertical line etched directly on the protective face of the cathode-ray tube (1). The fixed acquisition azimuth line (5) represents a 25,000-yard range segment of the acquisition (flashing) azimuth line (5, fig. 105) on the PPI presentation, 12,500 yards on each side of the acquisition range circle (6, fig. 105).

(3) *Target video.* The target video (4) is displayed as a brightened rectangular mark each time the electronic sweep (3) moves across the cathode-ray tube (1).

(4) *Fixed acquisition range line.* The fixed acquisition range line (6) is a horizontal line etched on the protective face of the cathode-ray tube (1). The intersection of the fixed acquisition range line (6) and the fixed acquisition azimuth line (5) represent the intersection of the acquisition (flashing) azimuth line and the acquisition range circle (5 and 6, fig. 105) on the PPI.

(5) *Electronic (track) cross.* The elec-



1—Cathode-ray tube
2—Electronic (track) cross
3—Electronic sweep
4—Target video
5—Fixed acquisition azimuth line
6—Fixed acquisition range line

Figure 107 (C). Precision indicator—basic presentation (U).

tronic (track) cross (2) appears when the TRACK CROSS switch is set to ON. The arms of the track cross represent the azimuth and range coordinates as set into the target tracking radar system. The switch is normally used for test and maintenance alinement; however, it may be used to confirm the position of the azimuth and range coordinates of the target track radar during an actual engagement.

c. Operation of Controls Affecting Presentation. The INTENSITY knob and the GAIN knob on the precision indicator are used to condition the cathode-ray tube for the desired presentation. The INTENSITY knob is used to adjust the brilliance of the electronic sweep. The contrast of all displays except the electronic sweep is controlled by the GAIN knob.

118 (U). HIPAR Equipment Control

The operation of the HIPAR system is controlled by operating various groups of controls in the HIPAR building or in the director station trailer. Each group is related to a control function. Each of the control functions is discussed separately in *a* through *d* below for operation of the HIPAR from the director station trailer. For the operation of the HIPAR system from the HIPAR building, the TEST ENABLE switch-indicator must be illuminated (red). Refer to TM 9-1430-254-12/5 or TM 9-1430-257-12/2 for the operation of the HIPAR system from the HIPAR building.

a. Antenna Azimuth Control. The antenna drive can be controlled from the HIPAR building or, remotely, from the trailer mounted director station. When the HIPAR system is energized through the "operate" condition and the TEST ENABLE indicator illuminates (white), the HIPAR ANT RPM switch on the auxiliary acquisition control interconnecting group controls the speed of rotation of the HIPAR antenna. When the HIPAR ANT RPM switch is set to 6, the HIPAR antenna rotates at 5⅔ to 7⅔ rpm; when it is set to 10, the antenna rotates at 9 to 11 rpm. During normal operation, the HIPAR ANT RPM switch remains in the 10 position.

b. Antenna Elevation Control. The elevation of the HIPAR antenna is fixed and no control is provided.

c. Frequency Selection. The HIPAR system operates on any one of ten preset frequencies. Selection of frequency is made from the HIPAR control-indicator. Ten channel select switch-indicators, CHANNEL 1 through CHANNEL 10, select the desired frequency of the HIPAR transmitter. When a frequency is selected, the desired CHANNEL switch-indicator is depressed; it illuminates (green) and all other switch-indicators illuminate (white). To change frequency channels, depress the desired CHANNEL switch-indicator and the new frequency is automatically selected. The normal mode of operation for the HIPAR will be the MANUAL CHANNEL SELECT mode. Before the AJAC programmer can be utilized in a tactical situation, the AJAC ENABLE switch-indicator will have to be operated. The AJAC programmer controls the HIPAR transmitter frequency under three basic modes of operation: manual channel select, an automatic mode, and a pulse-to-pulse mode. The AJAC programmer operates according to a fixed program in the automatic mode. The jam signal level is compared with two threshold levels of jamming severity: the "A" level and the "B" level.

(1) *Manual operation.* Below the "A" level, jamming is not considered a problem and the frequency is selected by the MANUAL CHANNEL SELECT switches. In this mode, the AJAC programmer functions as a monitor. When the jamming level exceeds the "A" level, the programmer circuits will illuminate the red JAMMING indicator on the HIPAR control-indicator. At this time, the battery control officer may decide to switch to the automatic mode by depressing the AJAC ENABLE switch-indicator and selecting either the AJAC SELECTED CHANNEL or AJAC ALL CHANNEL mode.

(2) *Automatic operation.* When the jamming is between the "A" and "B" levels, the AJAC programmer will change frequency at a rate that will make maximum use of the HIPAR

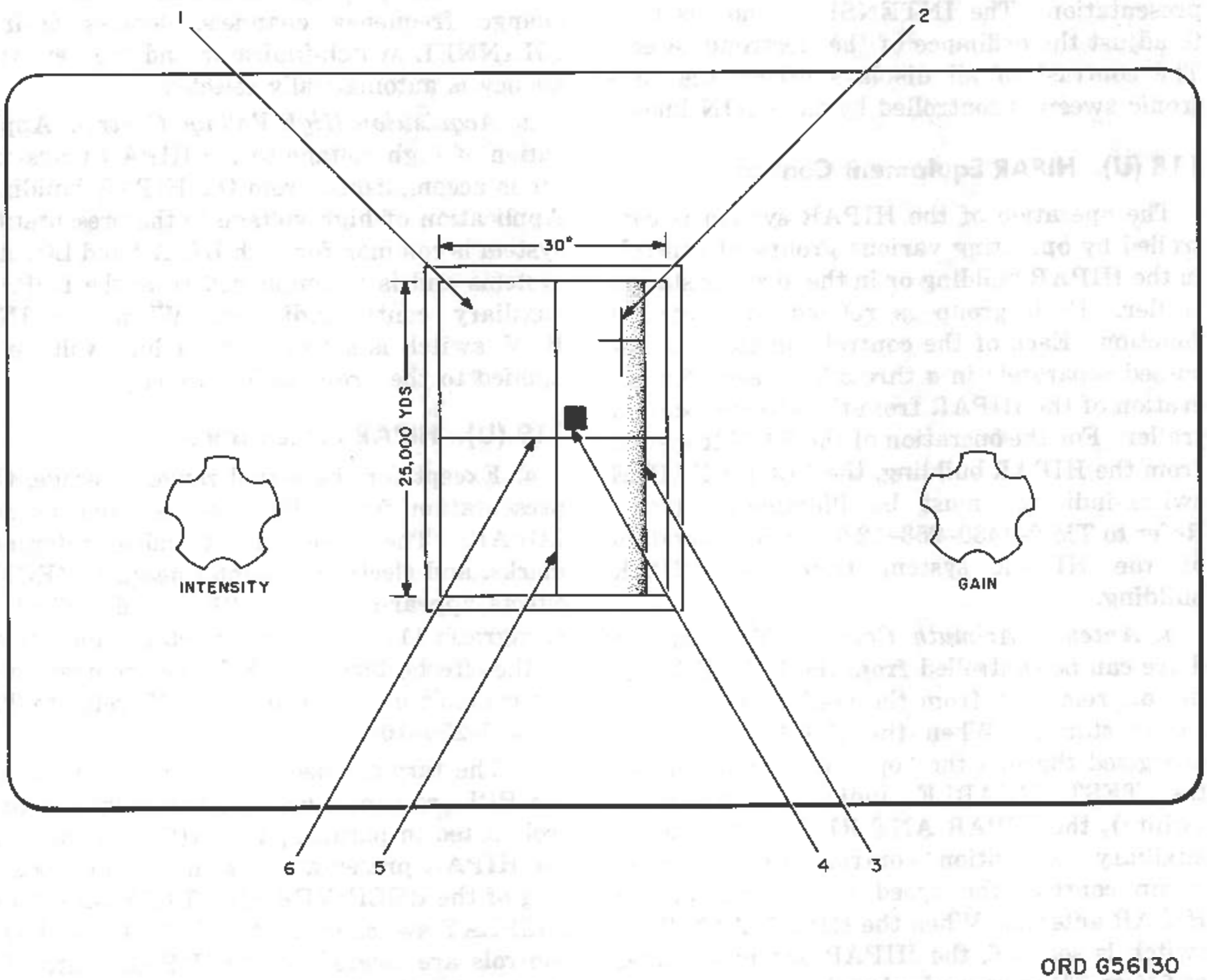
(LOPAR) (fig. 40). Once during each revolution the sweep brightens all displays on the cathode-ray tube (1) as the sweep coincides with each display.

(2) *Fixed acquisition azimuth line.* The fixed acquisition azimuth line (5) is a black vertical line etched directly on the protective face of the cathode-ray tube (1). The fixed acquisition azimuth line (5) represents a 25,000-yard range segment of the acquisition (flashing) azimuth line (5, fig. 105) on the PPI presentation, 12,500 yards on each side of the acquisition range circle (6, fig. 105).

(3) *Target video.* The target video (4) is displayed as a brightened rectangular mark each time the electronic sweep (3) moves across the cathode-ray tube (1).

(4) *Fixed acquisition range line.* The fixed acquisition range line (6) is a horizontal line etched on the protective face of the cathode-ray tube (1). The intersection of the fixed acquisition range line (6) and the fixed acquisition azimuth line (5) represent the intersection of the acquisition (flashing) azimuth line and the acquisition range circle (5 and 6, fig. 105) on the PPI.

(5) *Electronic (track) cross.* The elec-



1—Cathode-ray tube
2—Electronic (track) cross
3—Electronic sweep
4—Target video
5—Fixed acquisition azimuth line
6—Fixed acquisition range line

Figure 107 (C). Precision indicator—basic presentation (U).

tronic (track) cross (2) appears when the TRACK CROSS switch is set to ON. The arms of the track cross represent the azimuth and range coordinates as set into the target tracking radar system. The switch is normally used for test and maintenance alinement; however, it may be used to confirm the position of the azimuth and range coordinates of the target track radar during an actual engagement.

c. Operation of Controls Affecting Presentation. The INTENSITY knob and the GAIN knob on the precision indicator are used to condition the cathode-ray tube for the desired presentation. The INTENSITY knob is used to adjust the brilliance of the electronic sweep. The contrast of all displays except the electronic sweep is controlled by the GAIN knob.

118 (U). HIPAR Equipment Control

The operation of the HIPAR system is controlled by operating various groups of controls in the HIPAR building or in the director station trailer. Each group is related to a control function. Each of the control functions is discussed separately in *a* through *d* below for operation of the HIPAR from the director station trailer. For the operation of the HIPAR system from the HIPAR building, the TEST ENABLE switch-indicator must be illuminated (red). Refer to TM 9-1430-253-12/3 for the operation of the HIPAR system from the HIPAR building.

a. Antenna Azimuth Control. The antenna drive can be controlled from the HIPAR building or, remotely, from the trailer mounted director station. When the HIPAR system is energized through the "operate" condition and the TEST ENABLE indicator illuminates (white), the HIPAR ANT RPM switch on the auxiliary acquisition control interconnecting group controls the speed of rotation of the HIPAR antenna. When the HIPAR ANT RPM switch is set to 6, the HIPAR antenna rotates at 5⅔ to 7⅔ rpm; and when it is set to 10, the antenna rotates at 9 to 11 rpm. During normal operation, the HIPAR ANT RPM switch remains in the 10 position.

b. Antenna Elevation Control. The elevation of the HIPAR antenna is fixed and no control is provided.

c. Frequency Selection. The HIPAR system operates on any one of ten preset frequencies. Selection of frequency is made from the HIPAR auxiliary control-indicator. Ten channel select switch-indicators, CHANNEL 1 through CHANNEL 10, select the desired frequency of the HIPAR transmitter. When a frequency is selected, the desired CHANNEL switch-indicator is depressed; it illuminates (green) and all other switch-indicators illuminate (white). To change frequency channels, depress desired CHANNEL switch-indicator and the new frequency is automatically selected.

d. Acquisition High Voltage Control. Application of high voltage to the HIPAR transmitter is accomplished from the HIPAR building. Application of high voltage to the presentation system is common for both HIPAR and LOPAR systems and is accomplished from the LOPAR auxiliary control-indicator. When the IND H. V. switch is set to on (up) high voltage is applied to the presentation system.

119 (U). HIPAR Presentation

a. Except for the actual range coverage, the presentation for HIPAR is the same as for LOPAR. The basic target video, reference marks, and electronic countermeasures (ECM) effects appearing on the PPI are described in paragraph 117. For a more detailed discussion of the effects during an ECM environment and the controls used to combat ECM, refer to TM 9-1430-250-10/3.

b. The target video and reference marks on the PPI are controlled or affected by the controls listed in paragraph 117*a*(2). In addition, the HIPAR presentation is affected by the setting of the RECEIVER, CLUTTER GATE and DISPLAY switches and the GAIN knob. These controls are located on the HIPAR control-indicator (table 18).

119.1 (U). AAR Presentation

a. Except for the actual range coverage, the presentation for AAR is the same as for LOPAR. The basic target video, reference marks, and electronic countermeasures (ECM) effects appearing on the PPI are described in paragraph 118. For a more detailed discussion of the effects during an ECM environment and the controls used to combat ECM refer to TM 9–1430–250–10/3.

b. The target video and reference marks on the PPI are not affected by the controls in the trailer mounted director station. For information on the control of the presentation on the PPI during the AAR mode of operation, refer to the appropriate operator's manual.

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MTI capability. The number of frequency channels used during this mode is dependent upon whether the AJAC SELECTED CHANNEL or AJAC ALL CHANNEL modes are selected. In an operational situation, certain channels will be locked out and will not be selected by the programmer if the AJAC SELECTED CHANNEL switch-indicator is depressed.

(3) *Pulse-to-pulse mode.* Above the "B" level, all MTI processing is cancelled and the pulse-to-pulse mode is enabled allowing pulse-to-pulse frequency change on the basis of an optimum selection by the logic circuits in the AJAC programmer. This mode can be selected manually from the battery control console by depressing the AJAC P-P CHANNELS switch-indicator.

d. Acquisition High Voltage Control. Application of high voltage to the HIPAR transmitter is accomplished from the HIPAR building. Application of high voltage to the presentation system is common for both HIPAR and LOPAR systems and is accomplished from the LOPAR auxiliary control-indicator. When the IND H. V. switch is set to on (up), high voltage is applied to the presentation system.

119 (U). HIPAR Presentation

a. General.

(1) Except for the actual range coverage, the presentation for HIPAR is the same as for LOPAR. The basic target video, reference marks, and electronic countermeasures (ECM) effects appearing on the PPI are described in paragraph 117.

(2) The basic presentation and reference marks are controlled by the controls listed in *(a)* through *(c)* below and are explained in the applicable table.

(a) INTENSITY, GAIN, and SYMBOL INTENSITY knobs (table 14).

(b) EXPANSION, RANGE, and SYMBOLS switches (table 14).

(c) Range handwheel, range SLEW switch, range MAN-AID switch, and the RANGE dial (table 13).

b. Controls for the Receiver System (Table 18).

(1) *BASIC RECEIVER switch-indicator.* In this mode, the HIPAR operates at a steady PRF. The MTI signal processing, strobe channel, AJD, fast AGC, and all ECCM features are disabled. Gain of the receiver is controlled by the GAIN knob.

(2) *JS (JAM STROBE) ONLY RECEIVER switch-indicator.* In this mode, all processing circuits are bypassed and a jam strobe will be displayed.

(3) *AJD RECEIVER switch-indicator.* In this mode, the HIPAR operates at a staggered PRF. Received signals are processed by the target channel, strobe channel, and the MTI.

(4) *STAGGER OFF switch-indicator.* The staggered PRF of the AJD mode can be momentarily disabled while depressing the STAGGER OFF switch-indicator.

119.1 (U). AAR Presentation

a. Except for the actual range coverage, the AAR presentation is the same as for LOPAR. The basic presentation and reference marks are controlled by the controls listed in (1) through (3) below and are explained in the applicable table.

(1) INTENSITY, GAIN, and SYMBOL INTENSITY knobs (table 14).

(2) EXPANSION, RANGE, and SYMBOLS switches (table 14).

(3) Range handwheel, range SLEW switch, range MAN-AID switch, and the RANGE dial (table 13).

b. The target video presentation from the AAR is further controlled or affected by the setting of mode switch S1 on the AAR control-indicator as described in (1) through (3) below.

(1) The normal mode of operation for the AAR will be with the mode switch set to NORMAL RECEIVER. This mode of operation does not activate any ECCM circuits in the AAR.

(2) Depending upon the severity of ECM encountered, various ECCM circuits

may be activated by setting the mode switch to ECCM POSITION #1 or to ECCM POSITION #2. In ECCM POSITION #1, target video is processed by the range gate receiver and the logic receiver in the AAR. In ECCM POSITION #2, MTI dicke-fix and the AND circuits are added for target video processing. Also, a jamming azimuth strobe can be displayed by setting the mode switch to ECCM POSITION #2.

(3) When the mode switch is set to CHAFF WEATHER, the MTI 2 and MTI dicke-fix circuits process the target video. This combination of MTI circuits has the capability of cancelling radar returns of extended time duration. These circuits reduce the amplitude of the returns from extended targets such as clutter, chaff clouds, and weather formations.

Section III (C). AIR DEFENSE AREA INTEGRATION FACILITIES AND SELECTIVE IDENTIFICATION FEATURE/IDENTIFICATION FRIEND OR FOE PRESENTATIONS AND CONTROL

120 (C). Fire Unit Integration

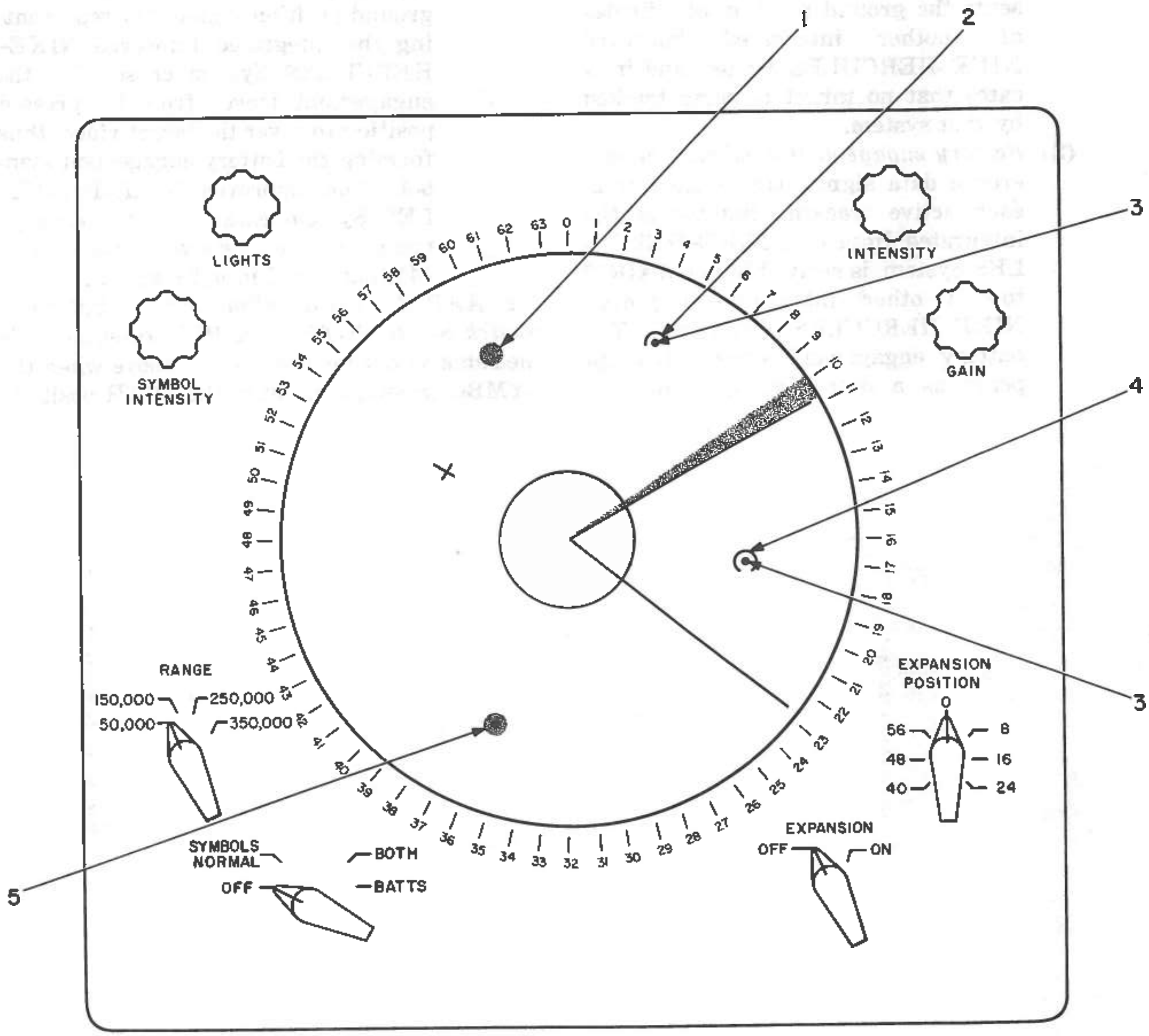
An Improved NIKE–HERCULES battery is integrated with the Army Air Defense Command Post (AADCP) and thereby into the air defense area by means of either fire unit integration facility (FUIF) equipment or with the battery terminal equipment (BTE). This integrated system is designed to relay accurate and nearly instantaneous designation data, reference data, command data, and identity data of highspeed aircraft between the AADCP and the Improved NIKE–HERCULES battery. Messages exchanged between the integrated battery and the AADCP are either frequency-shift-modulated (FSM) type or pulse-code-modulated (PCM) type depending upon the type of AADCP in use. When the AADCP is an AN/TSQ–51 or an AN/GSG–5, FSM is used; for an AN/MSQ–38, FSM or PCM may be used. In round robin operation, batteries exchange messages using the same format and type of modulation as employed in messages originating at the system AADCP. These data signals are converted into analog voltages for coordinate presentation of the target position and the battery ground position, and into ground or no-ground conditions representing target identities. The target identities, battery ground position, and battery engagement symbols displayed on the PPI presentation are explained and described in *a* and *b* below. The controls and indicators explained in *c* and *d* below are used in determining the tactics to be employed by an Improved NIKE–HERCULES System when used in an integrated fire control system. Two types of information are initiated or indicated by these controls and indicators. The controls and indicators explained in *c* below are used to transmit information from the AADCP to the integrated Improved NIKE–HERCULES System, and those explained in *d* below are used to transmit information from the integrated Improved NIKE–HERCULES System to the AADCP.

Note. The key numbers shown in parentheses in *a* and *b* below refer to figure 108.

a. PPI Presentation with SYMBOLS Switch Set to NORMAL.

(1) *Friend symbol.* The friend target identity data signal, transmitted from the AADCP to the equipment at the integrated Improved NIKE–HERCULES System, is converted into a friend symbol (2) designating a friendly target. This symbol appears on the PPI presentation as a semi-circle over the target video (3) of the target being identified.

(2) *Foe symbol.* The hostile target identity data signal, transmitted from the AADCP to the equipment at the integrated Improved NIKE–HERCULES System, is converted into a foe symbol (4) designating a hostile target. This symbol appears on the PPI presentation as a 330-degree arc surrounding



1—Battery ground position symbol
2—Friend symbol
3—Target video
4—Foe symbol
5—Battery engagement symbol

Figure 108 (C). PPI presentation—AADCP symbols displayed (U).

the target video (3) of the target being identified.

b. PPI Presentation with SYMBOLS Switch Set to BATTS.

(1) *Battery ground position symbol.* The reference data signal, transmitted from each active nontracking battery of the integrated Improved NIKE–HERCULES System, is relayed by the AADCP to all other integrated Improved NIKE–HERCULES Systems. This data signal is then converted into a battery ground position symbol (1). This symbol appears on

the PPI as a defocused spot. It represents the ground position coordinates of another integrated Improved NIKE–HERCULES System and indicates that no target is being tracked by that system.

(2) *Battery engagement symbol.* The reference data signal, transmitted from each active tracking battery of the integrated Improved NIKE–HERCULES System, is relayed by the AADCP to all other integrated Improved NIKE–HERCULES Systems. The battery engagement symbol (5) appears as a defocused spot covering the target video (3). The battery ground position symbol (1) representing the integrated Improved NIKE–HERCULES System chosen for the engagement moves from its present position to cover the target video, thus forming the battery engagement symbol. The Improved NIKE–HERCULES System chosen for the engagement, however, receives a foe symbol (4), explained in *a*(2) above.

c. AADCP Presentation with SYMBOLS Switch Set to BOTH. The PPI presentation is the same as outlined in *a* and *b* above when the SYMBOLS switch is set to the BOTH position.

d. Controls and Indicators used to Transmit Data from the AADCP to the Integrated Improved NIKE-HERCULES System.

(1) *REMOTE indicator light.* When illuminated, the REMOTE indicator light on the tactical control-indicator indicates that an engage command is being transmitted from the AADCP to the integrated Improved NIKE-HERCULES system. The signal illuminates the REMOTE indicator light and causes a foe symbol to appear on the PPI at the azimuth and range location of the target.

(2) *MISSILE—REM indicator light.* When illuminated, a MISSILE—REM indicator light on the battery signal panel-indicator indicates the type of missile (I–HE, B–HE, B–XS, or B–XL) designated to be used by the integrated Improved NIKE-HERCULES system for the immediate engagement.

(3) *HOLD FIRE indicator light.* When illuminated, the HOLD FIRE indicator light on the tactical control-indicator signals the integrated Improved NIKE-HERCULES system not to fire until signaled to do so; however, the system is to continue tracking the present target.

(4) *CEASE FIRE indicator light.* When illuminated, the CEASE FIRE indicator light on the tactical control-indicator signals the integrated Improved NIKE-HERCULES system to stop the present engagement.

e. Controls and Indicators Used to Transmit Data from the Integrated Improved NIKE-HERCULES System to the AADCP.

(1) *TARGET—DESIGNATED indicator lights and DESIGNATE—ABANDON switch.*

(*a*) When a target is to be designated to the target tracking radar system, the DESIGNATE—ABANDON switch on the target designate control-indicator is set to DESIGNATE. An acknowledge signal is automatically transmitted to the AADCP, causing the green TARGET—DESIGNATED indicator light on the battery signal panel-indicator to illuminate, and the ivory TARGET—DESIGNATED indicator light to extinguish. Signals representing the indications provided by these lights are transmitted to the AADCP.

(*b*) When a target is to be abandoned by the target tracking radar system, the DESIGNATE—ABANDON switch on the target designate control-indicator is set to ABANDON. This extinguishes the green TARGET—DESIGNATED indicator light and illuminates the ivory TARGET—DESIGNATED indicator light on the battery signal panel-indicator. It also extinguishes the green DESIGNATE indicator light and illuminates the ivory DESIGNATE indicator light indicating the target currently being tracked is to be abandoned. The abandon circuits are inoperative from the time the fire command is initiated until the missile burst signal is received. Signals representing the indications provided by these lights are transmitted to the AADCP.

(2) *TARGET—TRACKED indicator lights and TRACKED switch.* When the designated target is being tracked by the target tracking radar system, the TRACKED switch on the target antenna control group is depressed, causing the green TARGET—TRACKED indicator light to illuminate and the ivory TARGET—TRACKED indicator light to extinguish. Signals representing the indications provided by these lights are transmitted to the AADCP. During RBS missions, the target tracked indication to the AADCP is provided by setting NORMAL—RBS TEST switch S1 on the FUIF fixed attenuator to the RBS TEST position.

(3) *FIRE indicator lights and FIRE switch.* When a missile is to be fired, the FIRE switch on the tactical control-indicator is turned to on (up), causing the green FIRE indicator light on the battery signal panel-in-

dicator to illuminate and the ivory FIRE indicator light to extinguish. Signals representing the indications provided by these lights are transmitted to the AADCP.

(4) *ACKNOW switch.* When the ACKNOW switch is depressed, a signal is transmitted to the AADCP indicating that a signal transmitted to the integrated Improved NIKE-HERCULES System from the AADCP has been received, and the required action is being or will be taken.

(5) *OUT OF ACTION indicator lights and OUT OF ACTION switch.* When the integrated Improved NIKE-HERCULES System is incapable of normal action, the OUT OF ACTION switch is depressed, causing the OUT OF ACTION indicator light to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(6) *LOCAL indicator light and LOCAL switch.* When the integrated Improved NIKE-HERCULES System operating sequence and events for the current engagement originate from the particular Improved NIKE-HERCULES System, the LOCAL switch is depressed, causing the LOCAL indicator light on the tactical control-indicator to illuminate. A signal representing the indication provided by the LOCAL indicator light is transmitted to the AADCP.

(7) *ONE indicator light and ONE switch.* When the designated target is a single aircraft, the ONE switch is depressed, causing the ONE indicator light on the tactical control-indicator to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

Note. The target range indicator on the target radar control console may be used to determine the number of aircraft comprising the designated target since the target range indicator of the target tracking radar system gives a more accurate indication than any of the search or surveillance radars associated with the integrated fire defense system. For information on the target range indicator, refer to paragraph 125c.

(8) *FEW indicator light and FEW switch.* When the designated target consists of two to five aircraft, the FEW switch is depressed, causing the FEW indicator light on the tactical control-indicator to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(9) *MANY indicator light and MANY switch.* When the designated target consists of more than five aircraft, the MANY switch is depressed, causing the MANY indicator light on the tactical control-indicator to illuminate. A signal representing the indications provided by this light is transmitted to the AADCP.

(10) *EFFECTIVE indicator light and EFFECTIVE switch.* At the conclusion of a successful engagement, the EFFECTIVE switch is depressed, causing the EFFECTIVE indicator light on the tactical control-indicator to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(11) *INEFFECTIVE indicator light and INEFFECTIVE switch.* At the conclusion of an unsuccessful engagement, the INEFFECTIVE switch is depressed, causing the INEFFECTIVE indicator light on the tactical control-indicator to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(12) *VALIDITY switch.* When the VALIDITY switch is depressed, a signal is transmitted to the AADCP requesting a verification of the target designation. The AADCP checks to see if the correct target designation is displayed on the PPI. If a correction is necessary, the AADCP redesignates the correct target.

d. Controls and Indicators used to Transmit Data from the AADCP to the Integrated Improved NIKE–HERCULES System.

(1) *REMOTE indicator light.* When illuminated, the REMOTE indicator light on the tactical control-indicator indicates that an engage command is being transmitted from the AADCP to the integrated Improved NIKE–HERCULES System. The signal illuminates the REMOTE indicator light and causes a foe symbol to appear on the PPI at the azimuth and range location of the target.

(2) *MISSILE—REM indicator light.* When illuminated, a MISSILE—REM indicator light on the battery signal panel-indicator indicates the type of missile (I–HE, B–HE, B–XS, or B–XL) designated to be used by the integrated Improved NIKE–HERCULES System for the immediate engagement.

(3) *HOLD FIRE indicator light.* When illuminated, the HOLD FIRE indicator light on the tactical control-indicator signals the integrated Improved NIKE–HERCULES System not to fire until signaled to do so; however, the system is to continue tracking the present target.

(4) *CEASE FIRE indicator light.* When illuminated, the CEASE FIRE indicator light on the tactical control-indicator signals the integrated Improved NIKE–HERCULES System to stop the present engagement.

e. Controls and Indicators Used to Transmit Data from the Integrated Improved NIKE–HERCULES System to the AADCP.

(1) *TARGET—DESIGNATED indicator lights and DESIGNATE—ABANDON switch.*

(*a*) When a target is to be designated to the target tracking radar system, the DESIGNATE—ABANDON switch on the target designate control-indicator is set to DESIGNATE. An acknowledge signal is automatically transmitted to the AADCP, causing the green TARGET—DESIGNATED indicator light on the battery signal panel-indicator to illuminate, and the ivory TARGET—DESIGNATED indicator light to extinguish. Signals representing the indications provided by these lights are transmitted to the AADCP.

(*b*) When a target is to be abandoned by the target tracking radar system, the DESIGNATE—ABANDON switch on the target designate control-indicator is set to ABANDON. This extinguishes the green TARGET—DESIGNATED indicator light and illuminates the ivory TARGET—DESIGNATED indicator light on the battery signal panel-indicator. It also extinguishes the green DESIGNATE indicator light and illuminates the ivory DESIGNATE indicator light indicating the target currently being tracked is to be abandoned. The abandon circuits are inoperative from the time the fire command is initiated until the missile burst signal is received. Signals representing the indications provided by these lights are transmitted to the AADCP.

(2) *TARGET—TRACKED indicator lights and TRACKED switch.* When the designated target is being tracked by the target tracking radar system, the TRACKED switch on the target antenna control group is depressed, causing the green TARGET—TRACKED indicator light to illuminate and the ivory TARGET—TRACKED indicator light to extinguish. Signals representing the indications provided by these lights are transmitted to the AADCP.

(3) *FIRE indicator lights and FIRE switch.* When a missile is to be fired, the FIRE switch on the tactical control-indicator is turned to on (up), causing the green FIRE indicator light on the battery signal panel-in-

dicator to illuminate and the ivory FIRE indicator light to extinguish. Signals representing the indications provided by these lights are transmitted to the AADCP.

(4) *ACKNOW switch.* When the ACKNOW switch is depressed, a signal is transmitted to the AADCP indicating that a signal transmitted to the integrated Improved NIKE–HERCULES System from the AADCP has been received, and the required action is being or will be taken.

(5) *OUT OF ACTION indicator lights and OUT OF ACTION switch.* When the integrated Improved NIKE–HERCULES System is incapable of normal action, the OUT OF ACTION switch is depressed, causing the OUT OF ACTION indicator light to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(6) *LOCAL indicator light and LOCAL switch.* When the integrated Improved NIKE–HERCULES System operating sequence and events for the current engagement originate from the particular Improved NIKE–HERCULES System, the LOCAL switch is depressed, causing the LOCAL indicator light on the tactical control-indicator to illuminate. A signal representing the indication provided by the LOCAL indicator light is transmitted to the AADCP.

(7) *ONE indicator light and ONE switch.* When the designated target is a single aircraft, the ONE switch is depressed, causing the ONE indicator light on the tactical control-indicator to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

Note. The target range indicator on the target radar control console may be used to determine the number of aircraft comprising the designated target since the target range indicator of the target tracking radar system gives a more accurate indication than any of the search or surveillance radars associated with the integrated fire defense system. For information on the target range indicator, refer to paragraph 125c.

(8) *FEW indicator light and FEW switch.* When the designated target consists of two to five aircraft, the FEW switch is depressed, causing the FEW indicator light on the tactical control-indicator to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(9) *MANY indicator light and MANY switch.* When the designated target consists of more than five aircraft, the MANY switch is depressed, causing the MANY indicator light on the tactical control-indicator to illuminate. A signal representing the indications provided by this light is transmitted to the AADCP.

(10) *EFFECTIVE indicator light and EFFECTIVE switch.* At the conclusion of a successful engagement, the EFFECTIVE switch is depressed, causing the EFFECTIVE indicator light on the tactical control-indicator to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(11) *INEFFECTIVE indicator light and INEFFECTIVE switch.* At the conclusion of an unsuccessful engagement, the INEFFECTIVE switch is depressed, causing the INEFFECTIVE indicator light on the tactical control-indicator to illuminate. A signal representing the indication provided by this light is transmitted to the AADCP.

(12) *VALIDITY switch.* When the VALIDITY switch is depressed, a signal is transmitted to the AADCP requesting a verification of the target designation. The AADCP checks to see if the correct target designation is displayed on the PPI. If a correction is necessary, the AADCP redesignates the correct target.

121 (C). Selective Identification Feature/ Identification Friend or Foe (SIF/IFF) Presentation and Control

A MARK X (SIF) IFF set, consisting of interrogator set AN/TPX-20 and decoder group AN/TPX-3, provides a possible 165 codes for interrogating targets. The SIF/IFF is an aid in determining whether targets displayed on the PPI's are friendly or hostile. The SIF/IFF presentations are described in *a* below. The controls and indicators used to control the SIF/IFF presentations on the PPI are described in *b* through *e* below. For a more detailed explanation of the SIF/IFF equipment, refer to TM 11-5895-207-10, TM 11-5895-208-10, TM 11-5895-207-20 and TM 11-5895-208-20.

a. SIF/IFF Presentation. The four types of SIF/IFF displays are described in (1) through (4) below.

(1) *IFF CHALLENGE MODE 1, 2, or 3 return signal.* If the transponder in an aircraft has the same code and mode as that set in the NIKE-HERCULES ATBM system, an IFF return signal will be presented on the PPI's, when the aircraft is interrogated (challenged). The IFF return signal is displayed as one or more parallel arcs at a position greater in range than the target video.

(2) *Emergency mode return signal.* The emergency mode return signal is displayed as four parallel arcs at a position slightly greater in range than the target video. The emergency mode will be transmitted by the transponder on the aircraft when it is interrogated in any of the three modes.

(3) *Unidentified target video.* When operating with the SIF/IFF equipment, a target is considered unidentified if the target on the PPI does not display an IFF return.

(4) *Test signals.* The IFF receiver transmitter is tested by using the recognition signal simulator to generate local test signals. The mode 2, code 77 (TEST) signal appears as eight parallel arcs on the PPI.

b. Controls on the IFF Receiver-Transmitter and Coder. The controls in (1) through (4) below must be set as indicated to operate the SIF/IFF system from the battery control console. Normally, these controls are left in these positions so that the SIF/IFF equipment is automatically energized when power is applied to the LOPAR and HIPAR (or AAR) system.

(1) The POWER switch on the SIF/IFF receiver-transmitter is set to ON.

(2) The POWER switch on the recognition signal simulator is set to ON.

(3) The CHALLENGE switch on the coder control is set to OFF.

(4) The LOCAL-REMOTE switch on the coder control is set to REMOTE.

c. SIF/IFF Controls on the Recognition Signal Simulator. For remote operation of the recognition signal simulator from the battery control console, the controls in (1) through (5) below are set as indicated.

(1) The POWER switch is set to ON.

(2) The B+ ON switch is set to REMOTE.

(3) The TRIG IN Z switch is set to MODE 2.

(4) The OUTPUT switch is set to CODE.

(5) The OUTPUT-LEVEL and DELAY knobs are turned fully clockwise.

d. SIF/IFF Controls and Indicators on the Battery Control Console.

(1) *IFF ON indicator light.* If the controls for the SIF/IFF system are set as indicated in *b* and *c* above, the IFF ON indicator light on the IFF control-indicator illuminates. The illumination of the indicator light indicates that power has been applied to the SIF/IFF system.

(2) *CHALLENGE switch.* When the CHALLENGE switch is depressed, the SIF/IFF system transmits (interrogates) in the code and pulse spacing selected by the associated MODE 1, 2, or 3 CODE switch. The depressed CHALLENGE switch illuminates (green).

(3) *IFF GAIN knob.* The IFF GAIN knob on the IFF control-indicator is adjusted for the desired intensity of the SIF/IFF presentation on the PPI.

(4) *CHOP switch.* When the CHOP switch is set to ON, the SIF/IFF signals on the PPI appear as a series of dashes forming the arcs. When the switch is set to off (down), the SIF/IFF signals on the PPI appear as solid arcs.

(5) *GTC switch.* When the switch is set to SHORT, the SIF/IFF receiver is conditioned for the high level return signals from nearby targets. When the switch is set to LONG, the SIF/IFF receiver is conditioned for the low level signals from distant targets.

e. SIF/IFF Controls on the IFF Auxiliary Control-Indicator. The two concentric rotary switches for each mode of SIF/IFF interrogation are used to set the code. The code for each mode is prescribed by tactical operating procedures. The inner knob of each CODE switch sets the first significant number of the code. The outer knob of each CODE switch sets the second significant number of the code. The CODE switches and the OPERATE—TEST switch are described in (1) through (4) below.

(1) *MODE 1 CODE switches.* The inner knob is a 5-position switch which selects the second significant digit of the code. Any code number between 0 and 3 can be selected on the inner knob. The REM position on the inner knob is used to transfer the control of the code settings to a remote point where auxiliary remote switching control may be utilized. The outer knob of the MODE 1 CODE switch is an eight-position rotary switch which selects the first significant digit of the code and can be set to any number from 0 to 7.

(2) *MODE 2 CODE switches.* The two MODE 2 CODE switches are concentric eight-position rotary switches and can be set to any number between 0 and 7. The first significant digit of the code is selected by the outer knob and the second significant digit is selected by the inner knob. These switches set the code for mode 2 operation.

(3) *MODE 3 CODE switches.* The two MODE 3 CODE switches are concentric eight-position rotary switches and can be set to any number between 0 and 7. The first significant digit of the code is selected by the outer knob and the second significant digit is selected by the inner knob. These switches set the code for mode 3 operation.

(4) *OPERATE—TEST switch.* The OPERATE—TEST switch is a two-position toggle switch. When set to OPERATE, the SIF/IFF return signals are sent through the video decoder. If the code spacing of the SIF/IFF return signals agrees with the preselected mode and code of the SIF/IFF interrogator set, the signals will be displayed on the PPI. When the OPERATE—TEST switch is set to TEST, the video decoder is bypassed and all SIF/IFF return signals are presented on the PPI. The signal simulator is enabled in the TEST position.

Figure 109 (Deleted)

Figure 110 (Deleted)

Section IV (C). TARGET TRACKING, TARGET RANGING, AND MISSILE TRACKING RADAR SYSTEMS PRESENTATIONS AND CONTROL

122 (U). General

The TRR system is slaved in azimuth and elevation to the TTR system. The two systems obtain target range information independently of one another. During an engagement, the operation of both the TTR and TRR systems is functionally related to the operation of the LOPAR, the HIPAR/AAR, and the computer systems. The LOPAR or HIPAR/AAR system provides a means for designating the target in azimuth and range to the TTR and TRR systems. The computer system is, in turn, provided with necessary target position information by both the TTR and TRR systems. Under adverse conditions, the TRR system supplies the target range information to the computer system. Operation of the TTR and TRR systems, as performed by the operator, is controlled from the target radar control console (24, fig. 28), radar power supply group (13, fig. 28), target rang-

ing radar control (2, fig. 28), and remote transmitter control (6, fig. 28). During an engagement, the operation of the MTR system is also functionally related to the operation of the computer system and the launching equipment. The MTR system supplies the computer system with missile position information, and the computer system, in turn, supplies the MTR system with steering and burst orders for transmission to the missile. Operation of the MTR system, as performed by the operator, is controlled from the missile radar control console (3, fig. 28), and the radar power supply group.

123 (U). Radar Select Control

Selection of either the TTR or TRR system is controlled by the RANGE TRACK switch on the target antenna control group. When this switch is set to TTR or TRR, target range information is supplied to the computer system by the TTR or TRR system, respectively. Target elevation and azimuth information is supplied to the computer by the TTR system only.

124 (U). Target Tracking and Target Ranging Radar Equipment Control

The operation of the TTR and TRR systems is controlled by operating various groups of controls. Each group is related to a control function. Each of the control functions is discussed separately in *a* through *c* below.

a. Antenna and Range Unit Control. Controls used by operating personnel for controlling the antenna and range unit of the TTR and TRR systems in the elevation, azimuth, and range coordinates are on the target antenna control

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group (24, fig. 32). This paragraph groups these controls according to control function. Each of the control functions is discussed separately in (1) through (3) below.

Note. The TTR and TRR systems are controlled identically in the elevation, azimuth, and range coordinates; therefore, only the TTR system is discussed in (1) through (3) below.

(1) *Antenna elevation control.* The operator may control the TTR system in elevation in the manual, the aided, or the automatic mode, using the elevation MAN—AID—AUTO switch, elevation handwheel, elevation SLEW switch, and elevation dial. For a discussion of these controls, refer to tables 35 and 37.

(2) *Antenna azimuth control.* The operator may control the TTR system in azimuth in the manual, the aided, or the automatic mode, using the azimuth MAN—AID—AUTO switch, azimuth handwheel, and azimuth dial. For a discussion of these controls, refer to tables 35 and 37.

(3) *Antenna range control.* The operator may control the TTR system in range in the manual, the acquire aided, the track aided, and the automatic mode using the range MAN—ACQUIRE AID—TRACK AID—AUTO switch, range handwheel, range SLEW switch, and range dial. For a discussion of these controls, refer to tables 35 and 37.

b. Magnetron Frequency Control. The magnetron frequency control involves establishing the desired operating frequency of the magnetrons associated with the transmitting systems of the TTR and TRR systems. The magnetron frequency control for the TTR and TRR systems is described in (1) and (2) below.

Note. If magnetron frequency is changed when magnetron is functioning, described in (1) or (2) below, it may be necessary to rotate the HV SUPPLY knob on the target track control-power supply, MOD A HV knob, or MOD B HV knob on the countermeasures control-indicator to maintain proper magentron current on the respective MAGNETRON, MAG A, or MAG B meters.

(1) The magnetron frequency of the TTR system is controlled by the FREQUENCY switch and is indicated on the FREQUENCY meter. For discussion of these controls, refer to table 38.

(2) The TRR system employs two magnetrons, magnetron A and magnetron B, which operate simultaneously, one radiating RF energy into a dummy load and the other radiating RF energy into space. The frequency of magnetrons A and B is controlled by the FREQ switch on the countermeasures control-indicator, provided the TEST—OPERATE switch on the range radar power control-indicator is set to OPERATE, and the LOCAL—REMOTE switch on the remote transmitter control is set to REMOTE. When the MAG SEL switch on the countermeasures control-indicator is set to A, the frequency of magnetron B can be adjusted by operating the FREQ switch to either INC or DEC to increase or decrease the frequency of magnetron B. The frequency of the magnetron is indicated on the FREQUENCY meter on the range radar power control-indicator. The relative frequency position of magnetron A and magnetron B is displayed on the panoramic sweep of the countermeasures control-indicator. For a more detailed discussion of the panoramic sweep refer to paragraph 125*d*(1)(*a*). The frequency of the magnetron of the TTR system and magnetron A and magnetron B of the TRR system may be increased or decreased at the remote transmitter control, provided the LOCAL—REMOTE switch is set to LOCAL.

c. Target High Voltage Control. Target high voltage control involves observations and operations necessary to control the magnetron high voltage and the indicator high voltage for the presentation system of the trailer mounted tracking station. The magnetron high voltage control for the TTR and TRR systems is dis-

cussed in (1) below, and the indicator high voltage control is discussed in (2) below.

(1) Magnetron high voltage control of the TTR and TRR is discussed in (*a*) through (*d*) below.

Caution: **Safety devices are built into the magnetron high voltage circuits to insure proper energizing, but these safety devices may fail; therefore, energize the TTR system equipment in the manner prescribed in tables 80 and 81, and energize the TRR system equipment in the manner prescribed in tables 82 and 83, in sequence, to prevent damage to, or possible failure of, the equipment.**

(*a*) When the HV SUPPLY—READY indicator light on the target track control-power supply illuminates, the necessary time delay has elapsed, and high voltage can be applied to the magnetron of the TTR system. Prior to depressing the HV SUPPLY—ON switch, the HV SUPPLY knob must be turned fully counterclockwise to START. When the HV SUPPLY—ON switch is depressed, the HV SUPPLY—ON indicator light illuminates and the HV SUPPLY—READY indicator light extinguishes. The current of the energized magnetron is controlled by the HV SUPPLY knob. The HV SUPPLY knob is rotated clockwise until the pointer on the MAGNETRON meter indicates within the center of the white zone. The pointer may fluctuate, indicating arcing within the magnetron; when this occurs, the HV SUPPLY knob should be turned counterclockwise until the arcing ceases.

Caution: **If the pointer of the MAGNETRON meter continues to fluctuate, turn the HV SUPPLY knob counterclockwise to START.**

Note. For detailed instructions in "aging" of the magnetron, refer to TM 9-1430-251-12/2.

(*b*) To deenergize the magnetron of the TTR system, turn the HV SUPPLY knob counterclockwise to START. When the HV SUPPLY knob is turned to START and the HV SUPPLY—OFF switch is depressed, the HV SUPPLY—ON indicator light extinguishes and the HV SUPPLY —READY indicator light illuminates. The TTR system magnetron is now deenergized.

Note. The magnetron high voltage control procedures for magnetrons A and B are identical; therefore, only the procedures for magnetron A are given in (*c*) and (*d*) below.

(*c*) When the MAG A—READY indicator light on the countermeasures control-indicator illuminates, the necessary time delay has elapsed and high voltage can be applied to magnetron A of the TRR system. Prior to depressing the MAG A—HV ON switch, the MOD–A—HV knob should be turned fully counterclockwise. When the MAG A—HV ON switch is depressed, the MAG A —HV ON indicator light illuminates and the MAG A—READY indicator light extinguishes. After magnetron A is energized, the current of the magnetron is controlled by the MOD–A HV knob. The MOD–A HV knob is turned clockwise until the pointer of the MAG A meter indicates on the white line within the green block. The pointer may fluctuate, indicating arcing within the magnetron. When this occurs, the MOD–A HV knob should be turned counterclockwise until arcing ceases.

Caution: **If the pointer of the MAG A meter continues to fluctuate, turn the MOD–A HV knob counterclockwise to the stops.**

Note. For detailed instructions on "aging" of the magnetron, refer to TM 9-1430-251-12/2.

(*d*) To deenergize magnetron A of the

TRR system, turn the MOD-A HV knob counterclockwise to the mechanical stops. When the MOD-A HV knob is turned fully counterclockwise and the MAG A—HV OFF switch is depressed, the MAG A—READY indicator light illuminates, and the MAG A—HV ON indicator light extinguishes. Magnetron A of the TRR system is now deenergized.

(2) When the IND HV switch on the target track control-power supply is set to the on (up) position, the IND HV indicator light illuminates, and high voltage is applied to the cathode-ray tubes of the B scope indicator (19, fig. 32), the countermeasures control-indicator (9, fig. 32), the elevation indicator (26, fig. 32), the azimuth indicator (21, fig. 32), and the target range indicator (17, fig. 32). When high voltage is applied to the cathode-ray tubes, they illuminate, provided the INTENSITY knobs on the three A scopes, and the PAN and TRR INTENSITY knobs on the countermeasures control-indicator are properly adjusted.

125 (C). Target Tracking Radar System Presentations

Indicator presentations associated with the TTR and TRR systems are displayed on the B scope indicator (19, fig. 32), the countermeasures control-indicator (9, fig. 32), the elevation indicator (26, fig. 32), the azimuth indicator (21, fig. 32), and the target range indicator (17, fig. 32) on the target radar control console. The presentations and the controls used to modify them are described in *a* through *d* below.

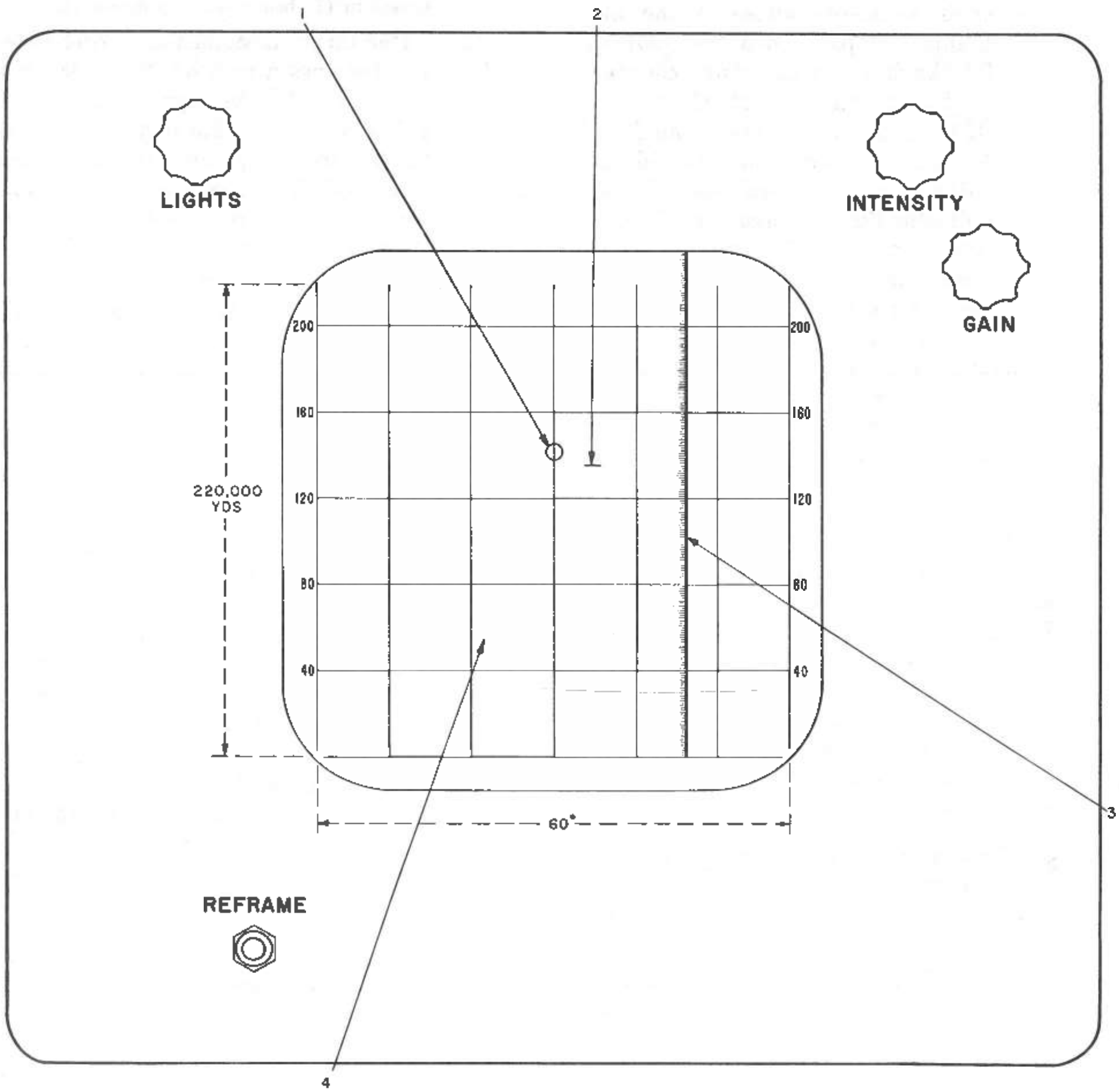
a. B Scope Indicator Presentation. The B scope indicator displays a sector of the PPI presentation (fig. 105), 60 degrees (1,066 mils) in azimuth and 220,000 yards in range. The B scope indicator presentation is shown on figure 111 and is described in (1) below. The controls used to condition the cathode-ray tube are described in (2) below. The controls used to modify the presentations are given in paragraph 124*a*.

Note. The key numbers shown in parentheses in (1) below refer to figure 111.

(1) After target designation, target video (2) becomes a part of the basic presentation and is displayed with the two reference marks, the target track antenna circle (1), and the electronic sweep (3). These reference marks and target video are described in (*a*) through (*c*) below.

(*a*) *Target track antenna circle.* The target track antenna circle is a circle displayed on the B scope indicator representing the electrical position of the target track antenna in azimuth and range. When the target is designated, automatic slewing begins when the ACQUIRE switch is operated. The target track antenna circle moves to a coordinate position (azimuth and range) near the target video. The azimuth and range are adjusted by rotating the azimuth and range handwheels so the circle is positioned to encircle the target video on the cathode-ray tube (4). As the target range and azimuth positions change, the circle is adjusted by rotating the azimuth and range handwheels to track the target in these coordinates. When the circle and the target video move to the left or right edge of the cathode-ray tube from the center line, the REFRAME switch is depressed, recentering the circle and the target video in azimuth only. When the target is tracked on the B scope indicator, the range MAN—ACQUIRE AID—TRACK AID—AUTO switch is set to ACQUIRE AID and the azimuth MAN—AID—AUTO switch is set to AID. For a detailed discussion of the antenna control in the manual, aided, and automatic modes, refer to paragraph 124*a* (1) through (3).

(*b*) *Target video.* Target video becomes a basic part of the presentation when a target has been detected by



1—Target track antenna circle
2—Target video
3—Electronic sweep
4—Cathode-ray tube

Figure 111 (C). B scope indicator—basic presentation (U).

the HIPAR/AAR or LOPAR system and has been designated to the TTR system. The target video appears with each rotation of the selected acquisition antenna through the selected 60-degree (1,066 mils) sector. Target video appears as a brightened line. The length of this line increases as the target video moves towards the lower edge of the cathode-ray tube and decreases to a small dot as the target moves to the upper edge of the cathode-ray tube. The target video appears with each

"paint" of the electronic sweep; however, due to the high persistency of the phosphor on the face of the cathode-ray tube, the target video appears as a "continuous" display.

(c) *Electronic sweep.* The electronic sweep produces a vertical trace extending from the upper (220,000 yards) to the lower (0 yards) edge of the cathode-ray tube. The trace moves across the cathode-ray tube in synchronism with the rotation of the selected acquisition antenna. Once during each rotation, the sweep brightens all displays on the cathode-ray tube as the sweep coincides with each display, except the circle which is "painted" in the dead time of the sweep and appears as a continuous display.

(2) The target video and the two reference marks described in (1) above are controlled or affected by four controls on the B scope indicator. For a discussion of these controls and the cathode-ray tube, refer to table 33.

b. Elevation and Azimuth Indicator Presentations. The elevation indicator presentation or azimuth indicator presentation is displayed by means of a cathode-ray tube (8, fig. 112). The type of presentation is determined by the position of the IND and PULSE switches on the target track control-power supply. Note that the PULSE switch affects the presentations on the elevation and azimuth indicators only when the TTR PULSE WIDTH—ENABLE switch is set to ENABLE (override). The presentation on the elevation indicator is also affected by the position of the PRESENTATION switch. If the PRESENTATION switch is set to H_T, the H_T scale is superimposed on the face of the cathode-ray tube and the presentation is deflected to indicate on the H_T scale the elevation being scanned by the TTR. The elevation being scanned is read by noting the position of the lower trace on the H_T scale. Three basic presentations are described in (1) through (3) below. The differences between presentations are described in (4) below. The cathode-ray tube presentations are adjusted by the controls on the front of the elevation indicator or azimuth indicator and are described in (5) below. Controls used to modify the presentations are described in (6) below.

Note. Since the elevation indicator presentation is identical to the azimuth indicator presentation except for the differences described in (4) below, only the elevation indicator presentation is discussed in (1) through (4) below.

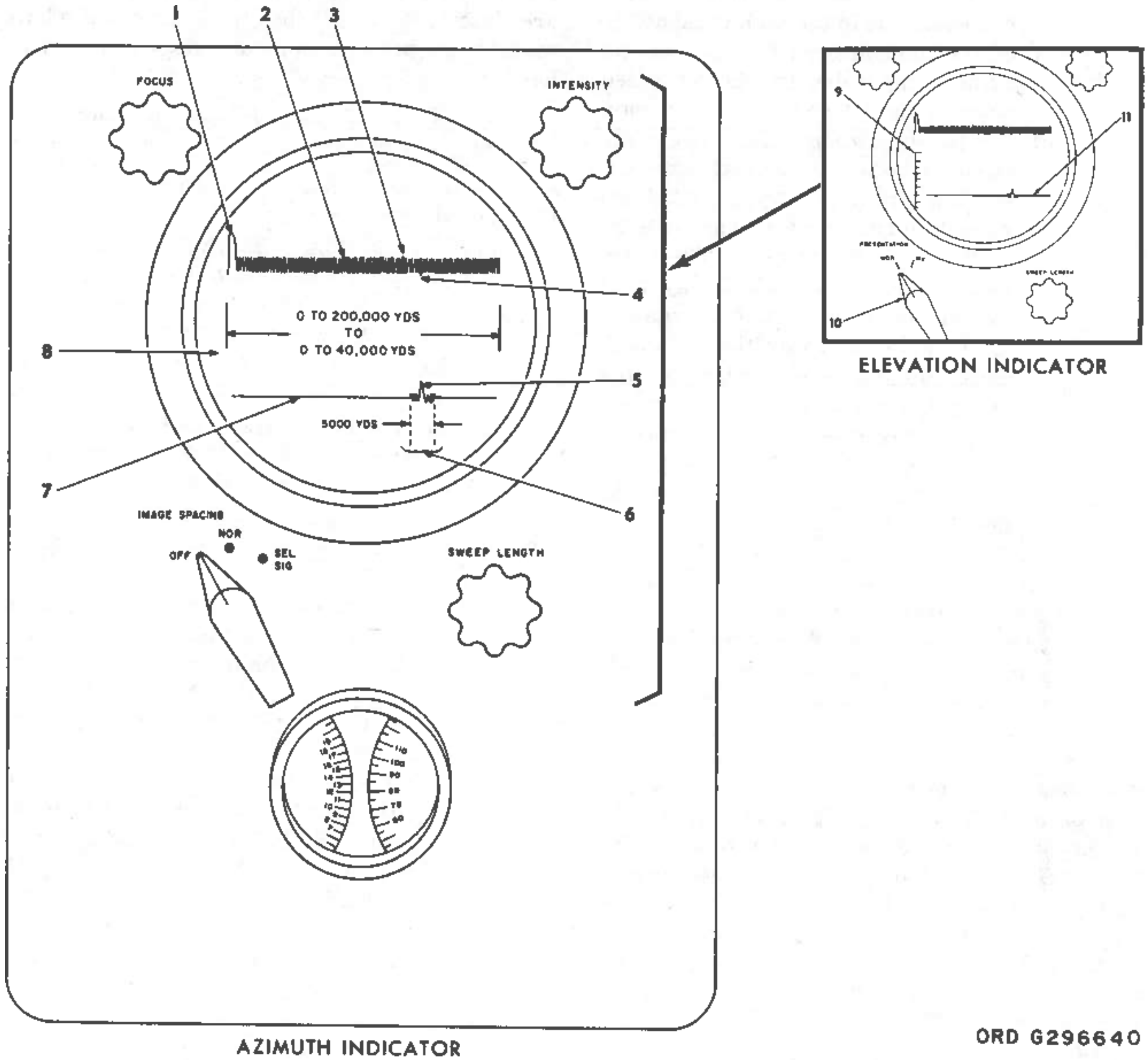
(1) *Presentation with IND switch set to A and PULSE switch set to LONG.* The presentation with the IND switch set to A and the PULSE switch set to LONG consists of an upper trace and an error trace. The reference marks on the upper trace and error trace, as shown in figure 112, are described in (*a*) and (*b*) below.

Note. The key numbers shown in parentheses in (*a*) and (*b*) below refer to figure 112, unless otherwise indicated.

(*a*) The upper trace (2) extends across the cathode-ray tube (8) and represents a maximum range of 200,000 yards. When the IND switch is set to A and the SWEEP LENGTH knob on the elevation indicator is rotated, the presentation can be adjusted to represent a minimum range of 40,000 yards and a maximum range of 200,000 yards. Superimposed on the upper trace is noise which is reduced to a minimum when the TTR system is locked on the target. The following reference marks appear on the upper trace: the transmitted pulse (1), the target "pip" (3), and the 1,000-yard range notch (4). These reference marks are described in *1* through *3* below.

1. Transmitted pulse. The transmitted pulse appears on the left side of the upper trace which represents 0 yards in range, and signifies the TTR system is transmitting. The transmitted pulse has no operational significance and appears because of inherent characteristics of the TTR system.

2. Target "pip." The target "pip"



1—Transmitted pulse
2—Upper trace (with noise)
3—Target "pip"
4—1,000-yard range notch
5—Error "pip"
6—5,000-yard receiver gate
7—Error trace
8—Cathode-ray tube
9—H_T scale
10—PRESENTATION switch
11—Deflected error trace

Figure 112 (C). Elevation or azimuth indicator—presentation—IND switch set to A and PULSE switch set to LONG (U).

becomes a part of the basic presentation when the track antenna reflector assembly (2, fig. 44) is pointing at the target. When the target "pip" is gated, target video appears as a raised vertical spike in the range notch.

3. 1,000-yard and 100-yard range notch. The 1,000-yard range notch appears on the upper trace when

"paint" of the electronic sweep; however, due to the high persistency of the phosphor on the face of the cathode-ray tube, the target video appears as a "continuous" display.

(c) *Electronic sweep.* The electronic sweep produces a vertical trace extending from the upper (220,000 yards) to the lower (0 yards) edge of the cathode-ray tube. The trace moves across the cathode-ray tube in synchronism with the rotation of the selected acquisition antenna. Once during each rotation, the sweep brightens all displays on the cathode-ray tube as the sweep coincides with each display, except the circle which is "painted" in the dead time of the sweep and appears as a continuous display.

(2) The target video and the two reference marks described in (1) above are controlled or affected by four controls on the B scope indicator. For a discussion of these controls and the cathode-ray tube, refer to table 33.

b. Elevation and Azimuth Indicator Presentations. The elevation indicator presentation is displayed by means of a cathode-ray tube (8, fig. 112). The type of presentation is determined by the position of the IND and PULSE switches on the target track control-power supply. Note that the PULSE switch affects the presentation on the elevation and azimuth indicators only when the TTR PULSE WIDTH—ENABLE switch is set to ENABLE (override). Three basic presentations are described in (1) through (3) below. The cathode-ray tube presentations are adjusted by the controls on the front of the elevation indicator and are described in (4) below. Controls used to modify the presentations are described in (5) below.

Note. The elevation indicator presentation is identical to the azimuth indicator presentation; therefore, only the elevation indicator presentation is discussed in (1) through (3) below.

(1) *Presentation with IND switch set to A and PULSE switch set to LONG.* The presentation with the IND switch set to A and the PULSE switch set to LONG consists of an upper trace and an error trace. The reference marks on the upper trace and error trace, as shown on figure 112, are described in (*a*) and (*b*) below.

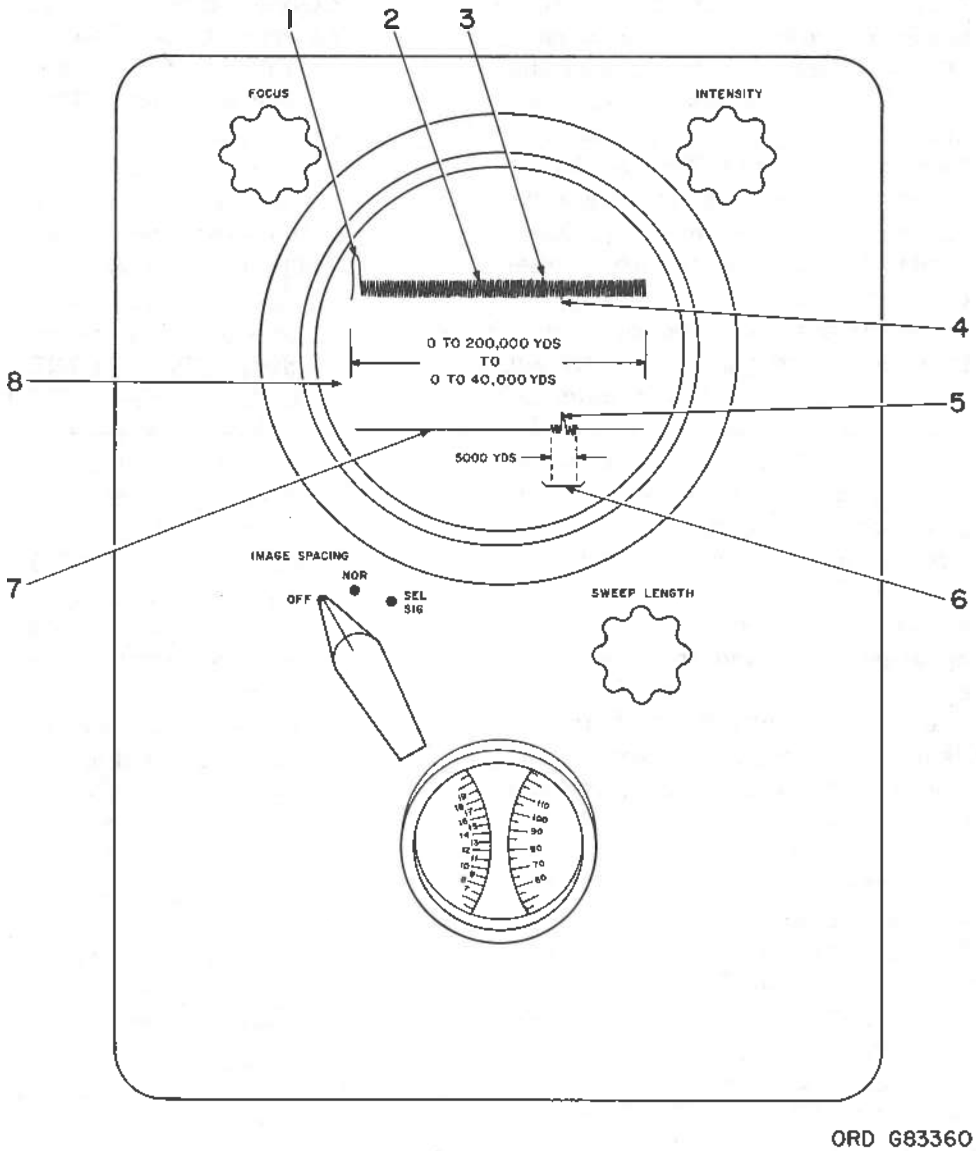
Note. The key numbers shown in parentheses in (*a*) and (*b*) below refer to figure 112, unless otherwise indicated.

(*a*) The upper trace (2) extends across the cathode-ray tube (8) and represents a maximum range of 200,000 yards. When the IND switch is set to A and the SWEEP LENGTH knob on the elevation indicator is rotated, the presentation can be adjusted to represent a minimum range of 40,000 yards and a maximum range of 200,000 yards. Superimposed on the upper trace is noise which is reduced to a minimum when the TTR system is locked on the target. The following reference marks appear on the upper trace: the transmitted pulse (1), the target "pip" (3), and the 1,000-yard range notch (4). These reference marks are described in *1* through *3* below.

1. *Transmitted pulse.* The transmitted pulse appears on the left side of the upper trace which represents 0 yards in range, and signifies the TTR system is transmitting. The transmitted pulse has no operational significance and appears because of inherent characteristics of the TTR system.

2. *Target "pip."* The target "pip" becomes a part of the basic presentation when the track antenna reflector assembly (2, fig. 44) is pointing at the target. When the target "pip" is gated, target video appears as a raised vertical spike in the range notch.

3. *1,000-yard and 100-yard range notch.* The 1,000-yard range notch appears on the upper trace when the PULSE switch is set to LONG. When the PULSE switch is set to SHORT, a 100-yard range

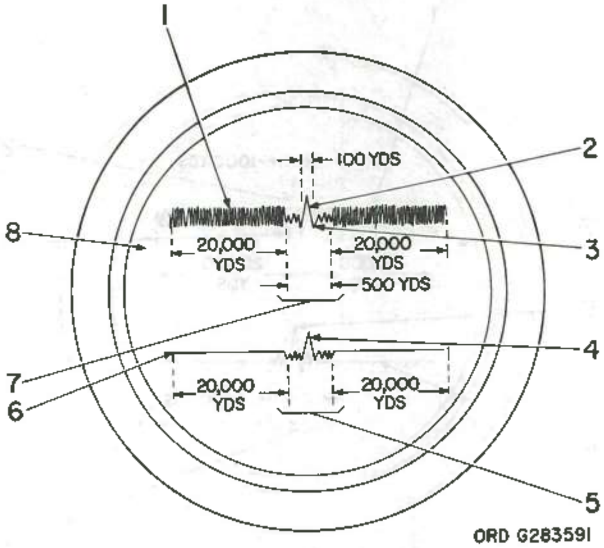


1—Transmitted pulse
2—Upper trace (with noise)
3—Target "pip"
4—1,000-yard range notch
5—Error "pip"
6—5,000-yard receiver gate
7—Error trace
8—Cathode-ray tube

Figure 112 (C). Elevation or azimuth indicator—presentation—IND switch set to A and PULSE switch set to LONG (U).

notch appears on the upper trace. The position of the range notch along the upper trace is determined by the quantity (in yards) set into the range unit by the range handwheel. This quantity is indicated on the range dial. For operation of the range handwheel in the four modes, refer to paragraph 124*a*(3).

(*b*) The error trace (7, fig. 112) extends across the face of the cathode-ray tube. Superimposed on the error trace within the 5,000-yard receiver gate (6) is noise that is reduced to a minimum when the TTR system is



1—Upper trace (with noise)
2—Target "pip"
3—100-yard range notch
4—Error "pip"
5—500-yard receiver gate
6—Error trace
7—500-yard expanded sweep
8—Cathode-ray tube

Figure 113 (U). Elevation or azimuth indicator—presentation—IND switch set to R, and PULSE switch set to SHORT (U).

the PULSE switch is set to LONG. When the PULSE switch is set to SHORT, a 100-yard range notch appears on the upper trace. The position of the range notch along the upper trace is determined by the quantity (in yards) set into the range unit by the range handwheel. This quantity is indicated on the range dial. For operation of the range handwheel in the four modes, refer to paragraph 124*a*(3).

(*b*) The error trace (7, fig. 112) extends across the face of the cathode-ray tube. Superimposed on the error trace within the 5,000-yard receiver gate (6) is noise that is reduced to a minimum when the TTR system is locked on the target. The transmitted pulse does not appear on the error trace because of the receiver gated video. The reference marks that appear on the error trace are the 5,000-yard receiver gate and the error "pip" (5), which are discussed in *1* and *2* below.

1. 5,000-yard receiver gate. The 5,000-yard receiver gate appears on the error trace when the PULSE switch is set to LONG. When the PULSE switch is set to SHORT, a 500-yard receiver gate appears on the error trace.

2. Error "pip." The error "pip" on the elevation indicator presentation appears below the error trace when the track antenna reflector assembly (2, fig. 44) is pointing below the target. The error "pip" appears above the error trace when the track antenna reflector assembly is pointing above the target. The error "pip" on the azimuth indicator presentation appears below the error trace when the track antenna reflector assembly is pointing to the left of the target, and appears above the error trace when the track antenna reflector assembly is pointing to the right of the target.

(2) *Presentation with IND switch set to R and PULSE switch set to SHORT.* The presentation, with the IND switch set to R and the PULSE switch set to SHORT, consists of an upper trace and an error trace. The reference marks on the upper trace and error trace, as shown on figure 113, are described in (*a*) and (*b*) below.

Note. The key numbers shown in parentheses in (*a*) and (*b*) below refer to figure 113, unless otherwise indicated.

(*a*) The upper trace (1) extends 40,000 yards across the cathode-ray tube (8) and 20,000 yards on either side of the 500-yard expanded sweep (7). The 100-yard range notch (3) appears within the 500-yard expanded sweep. When the track antenna reflector assembly (2, fig. 44) is pointing at the target, a "pip" appears in the 100-yard range notch. The target "pip" (2) is a

sharp spike centered within the 100-yard range notch. Superimposed on the upper trace is noise that is reduced to a minimum when the TTR system is locked on the target.

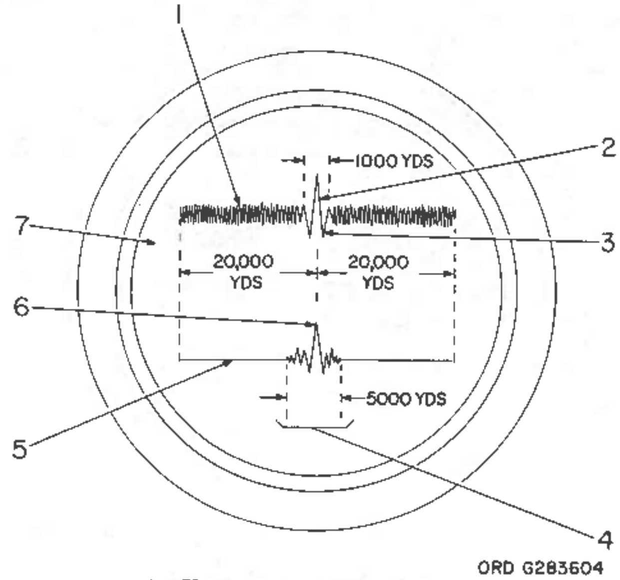
(*b*) The error trace (6) extends 20,000 yards on either side of the 500-yard receiver gate (5). The noise is superimposed on the error trace within the 500-yard receiver gate but is reduced to a minimum when the TTR system is locked on the target. The error "pip" (4) extends either below or above the error trace on the elevation and azimuth indicators when the track antenna reflector assembly (2, fig. 44) is not pointing at the target in either the elevation or azimuth coordinate. For a detailed discussion of the error "pip," refer to (1) (*b*) above.

(3) *Presentation with IND switch set to R and PULSE switch set to LONG.* The presentation, with the IND switch set to R and the PULSE switch set to LONG, consists of an upper trace and an error trace. The reference marks on the upper trace and error trace, as shown on figure 114, are described in (*a*) and (*b*) below.

Note. The key numbers shown in parentheses in (*a*) and (*b*) below refer to figure 114, unless otherwise indicated.

(*a*) The upper trace (1) extends 40,000 yards across the cathode-ray tube (7) and 20,000 yards on either side of the 1,000-yard range notch (3). When the track antenna reflector assembly (2, fig. 44) is pointing at the target, a "pip" appears in the 1,000-yard range notch. The target "pip" (2) is a sharp spike that is centered within the 1,000-yard range notch. Superimposed on the upper trace is noise that is reduced to a minimum when the TTR system is locked on the target.

(*b*) The error trace (5) extends 20,000 yards on either side of the 5,000-yard receiver gate (4). The noise is

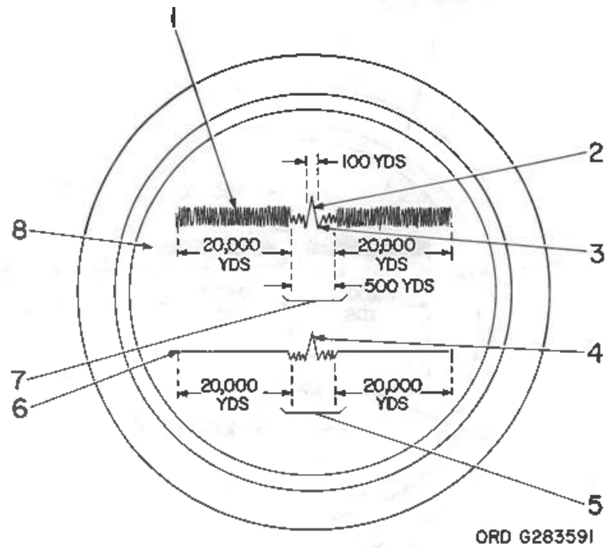


1—Upper trace (with noise)
2—Target "pip"
3—1,000-yard range notch
4—5,000-yard receiver gate
5—Error trace
6—Error "pip"
7—Cathode-ray tube

Figure 114 (U). Elevation or azimuth indicator—presentation—IND switch set to R, and PULSE switch set to LONG (U).

superimposed on the error trace within the 5,000-yard receiver gate but is reduced to a minimum when the TTR system is locked on the target. The error "pip" (6) extends either below or above the error trace on the elevation or azimuth indicators when the track antenna reflector assembly (2, fig. 44) is not pointing at the target in either the elevation or azimuth coordinate. For a detailed discussion of the error "pip," refer to (1) (*b*) above.

(4) *Elevation indicator presentation with PRESENTATION switch set to H_T.* The upper trace and the error trace are still present. However, an H_T scale is superimposed on the face of the cathode-ray tube. This scale represents an elevation spread from 0 to 90,000 feet and is divided into 3 main graduations with each representing 30,000 feet. The presentation is deflected by an H_T input from the H_T network in the computer amplifier re-



1—Upper trace (with noise)
2—Target "pip"
3—100-yard range notch
4—Error "pip"
5—500-yard receiver gate
6—Error trace
7—500-yard expanded sweep
8—Cathode-ray tube

Figure 113 (U). Elevation or azimuth indicator—presentation—IND switch set to R, and PULSE switch set to SHORT (U).

locked on the target. The transmitted pulse does not appear on the error trace because of the receiver gated video. The reference marks that appear on the error trace are the 5,000-yard receiver gate and the error "pip" (5), which are discussed in *1* and *2* below.

1. *5,000-yard receiver gate.* The 5,000-yard receiver gate appears on the error trace when the PULSE switch is set to LONG. When the PULSE switch is set to SHORT, a 500-yard receiver gate appears on the error trace.

2. *Error "pip."* The error "pip" on the elevation indicator presentation appears below the error trace when the track antenna reflector assembly (2, fig. 44) is pointing below the target. The error "pip" appears above the error trace when the track antenna reflector assembly is pointing above the target. The error "pip" on the azimuth indicator presentation appears below the error trace when the track antenna reflector assembly is pointing to the left of the target, and appears above the error trace when the track antenna reflector assembly is pointing to the right of the target.

(2) *Presentation with IND switch set to R and PULSE switch set to SHORT.* The presentation with the IND switch set to R and the PULSE switch set to SHORT consists of an upper trace and an error trace. The reference marks on the upper trace and error trace, as shown on figure 113, are described in (*a*) and (*b*) below.

Note. The key numbers shown in parentheses in (*a*) and (*b*) below refer to figure 113, unless otherwise indicated.

(*a*) The upper trace (1) extends 40,000 yards across the cathode-ray tube (8), and 20,000 yards on either side of the 500-yard expanded sweep (7). The 100-yard range notch (3) appears within the 500-yard expanded sweep. When the track antenna reflector assembly (2, fig. 44) is pointing at the target, a "pip" appears in the 100-yard range notch. The target "pip" (2) is a sharp spike centered within the 100-yard range notch. Superimposed on the upper trace is noise that is reduced to a minimum when the TTR system is locked on the target.

(*b*) The error trace (6) extends 20,000 yards on either side of the 500-yard receiver gate (5). The noise is superimposed on the error trace within the 500-yard receiver gate but is reduced to a minimum when the TTR system is locked on the target. The error "pip" (4) extends either below or above the error trace on the elevation and azimuth indicators when the track antenna re-

flector assembly (2, fig. 44) is not pointing at the target in either the elevation or azimuth coordinate. For a detailed discussion of the error "pip," refer to (1)(*b*) above.

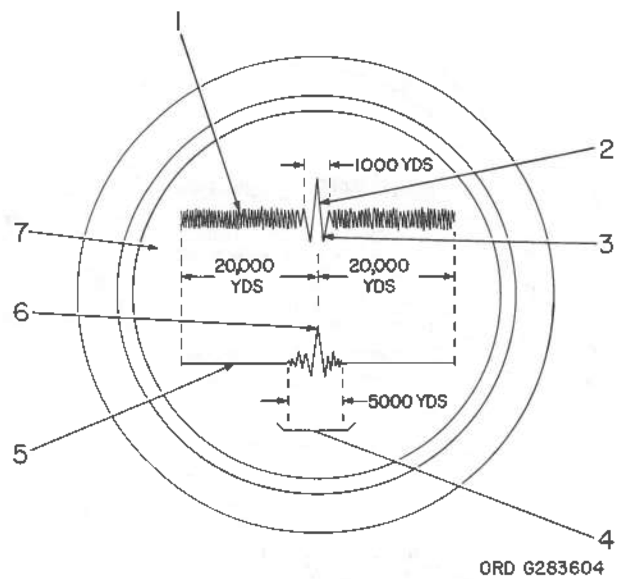
(3) *Presentation with IND switch set to R and PULSE switch set to LONG.* The presentation, with the IND switch set to R and the PULSE switch set to LONG, consists of an upper trace and an error trace. The reference marks on the upper trace and error trace, as shown on figure 114, are described in (*a*) and (*b*) below.

Note. The key numbers shown in parentheses in (*a*) and (*b*) below refer to figure 114, unless otherwise indicated.

(*a*) The upper trace (1) extends 40,000 yards across the cathode-ray tube (7), and 20,000 yards on either side of the 1,000-yard range notch (3). When the track antenna reflector assembly (2, fig. 44) is pointing at the target, a "pip" appears in the 1,000-yard range notch. The target "pip" (2) is a sharp spike that is centered within the 1,000-yard range notch. Superimposed on the upper trace is noise that is reduced to a minimum when the TTR system is locked on the target.

(*b*) The error trace (5) extends 20,000 yards on either side of the 5,000-yard receiver gate (4). The noise is superimposed on the error trace within the 5,000-yard receiver gate but is reduced to a minimum when the TTR system is locked on the target. The error "pip" (6) extends either below or above the error trace on the elevation or azimuth indicators when the track antenna reflector assembly (2, fig. 44) is not pointing at the target in either the elevation or azimuth coordinate. For a detailed discussion of the error "pip", refer to (1)(*b*) above.

(4) The cathode-ray tube presentations, as



1—Upper trace (with noise)
2—Target "pip"
3—1,000-yard range notch
4—5,000-yard receiver gate
5—Error trace
6—Error "pip"
7—Cathode-ray tube

Figure 114 (U). Elevation or azimuth indicator—presentation—IND switch set to R, and PULSE switch set to LONG (U).

selected by the IND switch and the PULSE switch, are adjusted by the three controls on the front of the elevation indicator. For a discussion of these controls, refer to table 37.

(5) The cathode-ray tube presentations are modified by controls described in paragraph 124*a* and TM 9-1430-250-10/3.

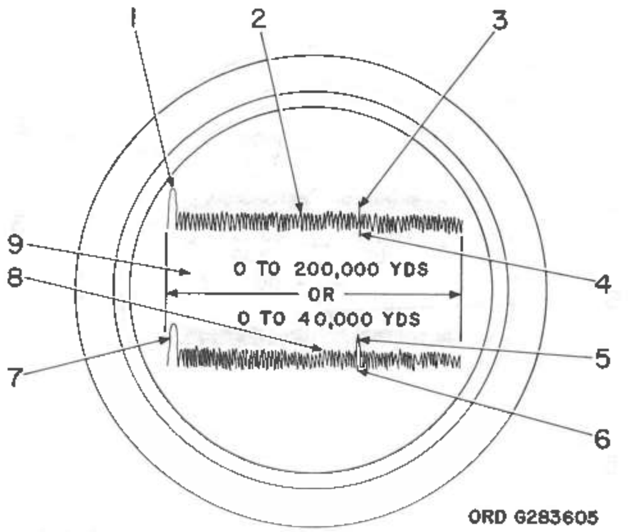
c. Target Range Indicator Presentations. The target range indicator presentations are presented by means of a cathode-ray tube (9, fig. 115) and a range dial. The type of presentation is determined by the position of the IND switch and the PULSE switch on the target control-power supply. Note that the PULSE switch affects the upper sweep presentation (TTR range information) only when the TTR PULSE WIDTH—ENABLE switch is set to ENABLE (override). Three basic presentations are described in (1) through (3) below. The cathode-ray tube presentations, as selected by the IND switch and the PULSE switch, are adjusted

lay group. The position of the deflected error (lower) trace on the H_T scale indicates the elevation being scanned by the TTR. For example, the deflected error trace (11, fig. 112) indicates the TTR is scanning a specified target area at an elevation of 30,000 feet.

(5) The cathode-ray tube presentations, as selected by the IND switch and the PULSE switch, are adjusted by the three controls on the front of the elevation indicator. For a discussion of these controls, refer to table 37.

(6) The cathode-ray tube presentations are modified by controls described in paragraph 124*a* and TM 9–1430–250–10/3.

c. Target Range Indicator Presentations. The target range indicator presentations are presented by means of a cathode-ray tube (9, fig. 115) and a range dial. The type of presentation is determined by the position of the IND switch and the PULSE switch on the target control-power supply. Note that the PULSE switch affects the upper sweep presentation (TTR range information) only when the TTR PULSE WIDTH—ENABLE switch is set to ENABLE (override). Three basic presentations are described in (1) through (3) below. The cathode-ray tube presentations, as selected by the IND switch and the PULSE switch, are adjusted



1—Transmitted pulse
2—Target track trace (with noise)
3—Target "pip"
4—1,000-yard range notch
5—Target "pip"
6—1,000-yard range notch
7—Transmitted pulse
8—Target range trace (with noise)
9—Cathode-ray tube

Figure 115 (C). Target range indicator—presentation —IND switch set to A and PULSE switch set to LONG (U).

by the controls on the front of the target range indicator and described in (4) below. Controls used to modify the presentation are described in (5) below.

(1) *Presentation with IND switch set to A and PULSE switch set to LONG.* The presentation, with the IND switch set to A and the PULSE switch set to LONG, consists of a target track trace and a target range trace. The reference marks on the target track trace and the target range trace, as shown on figure 115 are described in (*a*) and (*b*) below.

Note. The key numbers shown in parentheses in (*a*) and (*b*) below refer to figure 115 unless otherwise indicated.

(*a*) The target track trace (2) extends across the cathode-ray tube (9) and represents a maximum range of 200,000 yards. When the IND switch is set to A and the SWEEP LENGTH knob is rotated, the presentation can be adjusted to represent a minimum range of 40,000 yards and a maximum range of 200,000 yards. Superimposed on the target track trace is noise which is reduced to a minimum when the TTR system is locked on the target. The following reference marks appear on the target track trace: the transmitted pulse (1), the target "pip" (3), and the 1,000-yard range notch (4). These reference marks are described in *1* through *3* below.

1. Transmitted pulse. The transmitted pulse appears on the left side of the target track trace which represents 0 yards in range and signifies the TTR system is transmitting. The transmitted pulse has no operational significance and appears because of inherent characteristics of the TTR system.

2. Target "pip". The target "pip" (3) becomes a part of the basic presentation when the track antenna reflector assembly (2, fig. 44) is pointing at the target. When the target "pip" is gated, target video appears as a raised vertical spike in the 1,000-yard range notch (4).

3. 1,000-yard and 100-yard range notch. The 1,000-yard range notch appears on the target track trace when the PULSE switch is set to LONG. When the PULSE switch is set to SHORT, a 100-yard range notch appears on the target track trace. The position of the range notch along the target track trace is determined by the quantity (in yards) set into the range unit by the range handwheel. This quantity is indicated on the range dial. For operational use of the range handwheel in the four modes, refer to paragraph 124*a*(3).

(*b*) The target range trace (8) extends across the cathode-ray tube and rep-

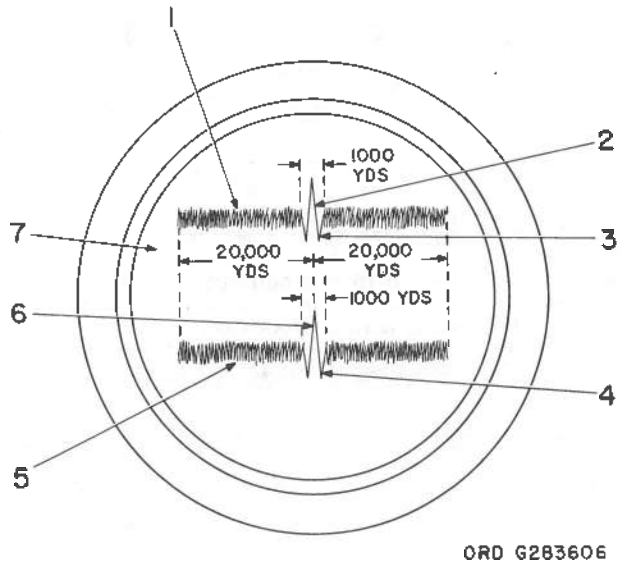
resents a maximum range of 200,000 yards. When the IND switch is set to A, the SWEEP LENGTH knob is rotated and the presentation can be adjusted to represent a minimum range of 40,000 yards and a maximum range of 200,000 yards. Superimposed on the target range trace is noise that is reduced to a minimum when the TRR system is locked on the target. The target "pip" (5), the 1,000-yard range notch (6), and the transmitted pulse (7) displayed on the target range trace are identical to the reference marks described in c(1)(*a*) *1* through *3* above.

(2) *Presentation with IND switch set to R and PULSE switch set to LONG.* The presentation, with the IND switch set to R and the PULSE switch set to LONG, consists of a target track trace and a target range trace. The reference marks displayed on the target track trace and the target range trace, as shown on figure 116, are described in (*a*) and (*b*) below.

Note. The key numbers shown in parentheses in (*a*) and (*b*) below refer to figure 116 unless otherwise indicated.

(*a*) The target track trace (1) extends 40,000 yards across the cathode-ray tube (7), and 20,000 yards on either side of the 1,000-yard range notch (3). When the track antenna reflector assembly (2, fig. 44) is pointing at the target, a "pip" appears in the 1,000-yard range notch. The target "pip" (2) is a sharp spike that is centered within the range notch. Superimposed on the target track trace is noise that is reduced to a minimum when the TTR system is locked on the target.

(*b*) The target range trace (5) extends 40,000 yards across the cathode-ray tube and 20,000 yards on either side of the 1,000-yard range notch (4). When the range antenna reflector (1, fig. 44) is pointing in the direction of the target, a "pip" appears in the 1,000-yard range notch (4). The target "pip" (6) is a sharp spike centered within the 1,000-yard range notch. Superimposed on the target range trace is noise that is reduced to a minimum when the TRR system is locked on the target.



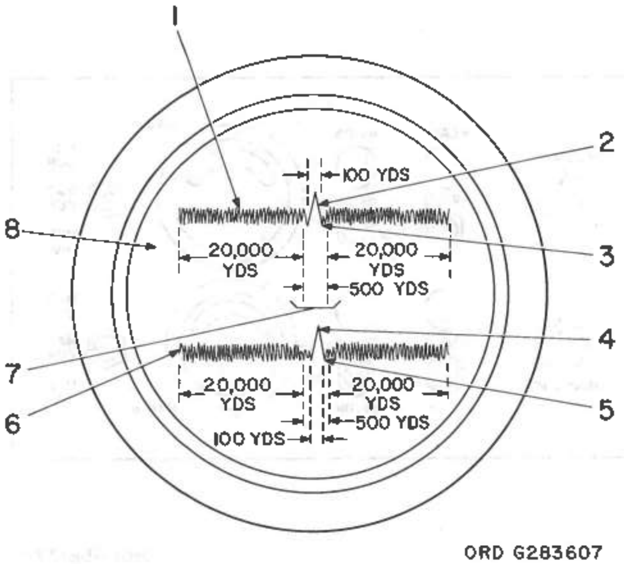
1—Target track trace (with noise)
2—Target "pip"
3—1,000-yard range notch
4—1,000-yard range notch
5—Target range trace (with noise)
6—Target "pip"
7—Cathode-ray tube

Figure 116 (U). Target range indicator—presentation—IND switch set to R and PULSE switch set to LONG (U).

(3) *Presentation with IND switch set to R and PULSE switch set to SHORT.* The presentation, with the IND switch set to R and the PULSE switch set to SHORT, consists of a target track trace and a target range trace. The reference marks displayed on the target track trace and the target range trace, as shown in figure 117, are described in (*a*) and (*b*) below.

Note. The key numbers shown in parentheses in (*a*) and (*b*) below refer to figure 117, unless otherwise indicated.

(*a*) The target track trace (1) extends 40,000 yards across the cathode-ray tube (8) and 20,000 yards on either



1—Target track trace (with noise)
2—Target "pip"
3—100-yard range notch
4—Target "pip"
5—100-yard range notch
6—Target range trace (with noise)
7—500-yard expanded sweep
8—Cathode-ray tube

Figure 117 (U). Target range indicator—presentation —IND switch set to R, and PULSE switch set to SHORT (U).

side of the 500-yard expanded sweep (7). The 100-yard range notch (3) appears within the 500-yard expanded sweep. When the track antenna reflector assembly (2, fig. 44) is pointing at the target, a "pip" appears in the 100-yard range notch. The target "pip" (2) is a sharp spike centered within the 100-yard range notch. Superimposed on the target track trace is noise that is reduced to a minimum when the TTR system is locked on the target.

(*b*) The target range trace (6) extends 40,000 yards across the cathode-ray tube and 20,000 yards on either side of the 500-yard expanded sweep. The 500-yard expanded sweep of the target range trace is identical to the 500-yard expanded sweep of the target track trace. When the range antenna reflector (1, fig. 44) is pointing at the target, a "pip" appears in the 100-yard range notch (5). The target "pip" (4) is a sharp spike centered within the 100-yard range notch. Superimposed on the target range trace is noise that is reduced to a minimum when the TRR system is locked on the target.

(4) The cathode-ray tube presentations, as selected by the IND switch and the PULSE switch, are adjusted by the three controls on the front of the target range indicator and are described in *b*(4) above.

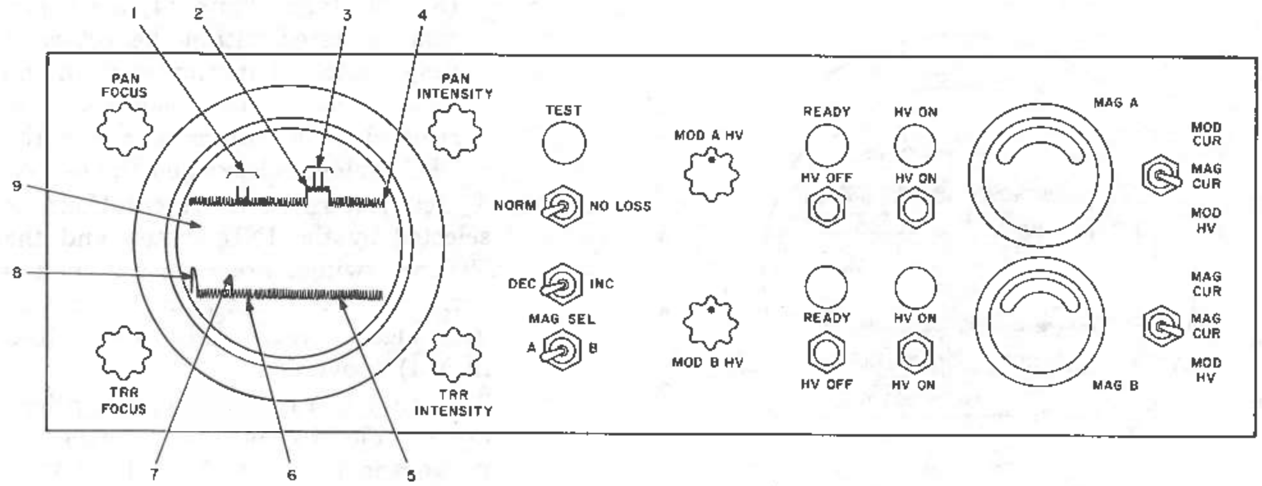
(5) The cathode-ray tube presentations are modified by controls described in paragraph 124*a* and TM 9-1430-250-10/3.

d. Countermeasures Control-Indicator Presentation. The countermeasures control-indicator presentation consists of an upper and lower trace. The upper trace is a panoramic display of the frequency spectrum of the TRR system. The lower trace is a normal A presentation and is identical to the target range trace on the target range indicator. The countermeasures control-indicator presentation, as shown on figure 118, is described in (1) below. The controls used to condition the cathode-ray tube are described in (2) below. The controls used to modify the presentation are described in (3) below.

Note. The key numbers shown in parentheses in (1) and (2) below refer to figure 118.

(1) The countermeasures control-indicator presentation is presented by means of a cathode-ray tube (9). The panoramic sweep (4) and the target range trace (5) are described in (*a*) and (*b*) below, respectively.

(*a*) The panoramic sweep represents the tunable frequency spectrum of the TRR system. Two "pairs of pips" are displayed on the panoramic sweep, one representing the relative frequency position of magnetron A and the other representing the relative frequency position of magnetron B. Between each "pip" of the "pair of pips" is a span of 120 mc. The 120-mc span represents the fre-



1—"Pair of pips" of stand-by magnetron
2—Pedestal
3—"Pair of pips" of radiating magnetron
4—Panoramic sweep
5—Target range trace
6—Range notch
7—Target "pip"
8—Transmitted pulse
9—Cathode-ray tube

Figure 118 (U). Countermeasures control-indicator—presentation (U).

quency limits of the transmitting magnetron at that position on the frequency spectrum. The "pair of pips" of stand-by magnetron (1) (magnetron B) is displayed as two thin lines on the panoramic sweep. The "pair of pips" of radiating magnetron (3) (magnetron A) is displayed as two thin lines on a pedestal (2).

(*b*) The target range trace extends 200,000 yards across the cathode-ray tube. When the IND switch on the target track control-power supply is set to R, the target range trace on the target range indicator is displayed as a 40,000-yard sweep; however, the display on the countermeasures control-indicator remains at 200,000 yards. A 1,000-yard range notch is displayed on the target range trace, provided the PULSE switch is set to LONG. When the PULSE switch is set to SHORT and the TTR PULSE WIDTH—ENABLE switch is set to ENABLE, a 100-yard range notch is displayed on the target range trace. Superimposed on the target range trace is noise that is reduced to a minimum when the TRR is locked on a target. The target "pip" (7), when gated, appears as a single thin line on the target range trace. When the target is gated the target "pip" appears centered within the range notch. Under adverse conditions, when the noise becomes extreme and target video becomes obscured or is difficult to discern, it may be necessary to switch to the stand-by magnetron. For operational use of the countermeasures control-indicator under adverse conditions, refer to TM 9-1430-250-10/3.

(2) Controls used to condition the cathode-ray tube are the PAN FOCUS, PAN INTENSITY, TRR INTENSITY, and TRR FOCUS knobs. For a discussion of these controls, refer to table 32.

(3) Controls used to modify the presentation are the MAG SEL and FREQ switches. For a discussion of these controls, refer to table 32.

126 (U). Missile Tracking Radar System Control

a. General. During a normal engagement, the operation of the MTR system is functionally related to the operation of the computer system and the missile guidance set. The MTR system transmits coded RF pulses to the missile guidance set. These coded pulses trigger the missile guidance set, causing it to transmit a return pulse to the MTR system. The pulses received from the missile guidance set enable the MTR system to supply the computer system with missile position information. The computer system compares this information with target position information received from the TTR and TRR systems, and issues the proper steering or burst orders for the missile. These orders are supplied to the MTR system, which in turn sends them to the missile. Two methods of transmitting these orders are used in the NIKE-HERCULES System. These command systems are discussed in (1) and (2) below.

(1) *NIKE-HERCULES command system.* The NIKE-HERCULES command system converts steering and burst orders from the computer into signals suitable for transmission to the missile and generates pulse groups of four pulses at precisely spaced intervals. The time interval between the pulses is coded to represent the battery code and the missile steering orders. A fifth pulse is generated to transmit the burst command.

(2) *NIKE-AJAX command system.* The NIKE-AJAX command system converts steering and burst orders from the computer into an ac signal and uses this ac signal to frequency-modulate the pulse repetition rate of the coded pulse pairs that are transmitted to the missile.

Note. The discussion in *b* through *d* below provides a method of acquiring the missile in the "test" condition only. This method is not to be used during normal "operate" conditions. For the discussion of the missile acquisition in "operate" condition, refer to paragraph 149*l*.

b. Missile Range Control. All controls necessary for operation of the range system of the MTR system are on the missile track control drawer (9, fig. 30) on the missile radar control console. Prior to the "operate" condition, the TEST switch is set to TEST to enable the range circuits for manual and aided mode operation. The range represented by the MTR system is indicated on the range dial of the range indicator. The range system of the MTR system has three modes of operation: manual, aided, and automatic, which are used when the MTR system is in the test condition. The automatic mode is always used during normal operation of the MTR system.

(1) When operating in the manual mode, the TEST switch is set to TEST and the range MAN—AID—AUTO switch is set to MAN. The range handwheel is rotated to increase or decrease the missile range, as indicated on the range dial. The range SLEW switch may be operated to increase or decrease the range at a more rapid rate than is provided by rotating the range handwheel. When the computer system is conditioned for action or tracking test, the LAUNCHER ACQUIRE switch is operated to automatically slew to the range of the designated missile or to the flight simulator group if a missile has not been designated.

(2) When operating in the aided mode, the TEST switch is set to TEST and the range MAN—AID—AUTO switch is set to AID. When the range handwheel is rotated and then released, missile range, as indicated on the range dial, continues to increase or decrease. The direction and rate at which the range continues to increase or decrease remain the same as they were at the time the range handwheel was released.

(3) When operating in the automatic mode, the TEST switch is set to TEST, and the range MAN—AID—AUTO switch is set to AUTO. The MTR system locks on and automatically tracks the designated missile in range. If, during automatic tracking the MTR system loses the missile, the

missile "pip" (3, fig. 119) no longer appears in the 100-yard range notch and the COAST indicator light illuminates. However, if the coast DISABLE switch is set to off (down) position, the MTR system continues to track at the existing range. When the missile "pip" reappears in the 100-yard range notch on the range indicator presentation, the COAST indicator light extinguishes, and the MTR system continues to automatically track the missile in range. For a detailed explanation of the range indicator presentation, refer to paragraph 127*a*. For a detailed explanation of the coast circuit operation, refer to paragraph 149*n*(5).

c. Missile Azimuth Control. All controls necessary for the operation of the azimuth positioning system of the MTR system are on the missile track control drawer. The azimuth to which the track antenna reflector assembly (2, fig. 44) is pointing is indicated by the AZIMUTH dial on the missile track indicator. The azimuth positioning system has three modes of operation: manual, aided, or automatic, which are used when the MTR system is in the test condition. The automatic mode is always used during normal operation of the MTR system.

(1) When operating in the manual mode, the TEST switch is set to TEST, and the azimuth MAN—AID—AUTO switch is set to MAN. The azimuth handwheel is then rotated either clockwise or counterclockwise to position the track antenna reflector assembly (2, fig. 44) to the desired azimuth. When the TEST switch is set to TEST and the LAUNCHER ACQUIRE switch is operated, the track antenna reflector assembly automatically slews to the azimuth of the designated missile or to the flight simulator group if a missile has not been designated.

(2) When operating in the aided mode, the TEST switch is set to TEST, and the azimuth MAN—AID—AUTO switch is set to AID. When the azimuth MAN—AID—AUTO switch is set to AID and the azimuth handwheel is rotated and then released, the missile azimuth, as indicated on the azimuth dial, continues to increase or decrease. The direction and rate at which the azimuth continues to increase or decrease remain the same as they were at the time the azimuth handwheel was released.

(3) When operating in the automatic mode, the TEST switch is set to TEST, and the azimuth MAN—AID—AUTO switch is set to AUTO. The MTR system locks on and automatically tracks the missile in azimuth.

d. Missile Elevation Control. All controls necessary for the operation of the elevation positioning system of the MTR system are on the missile track control drawer. The elevation angle to which the track antenna reflector assembly (2, fig. 44) of the missile track antenna-receiver-transmitter group is pointing is indicated by the ELEVATION dial on the missile track indicator. The elevation positioning system has three modes of operation: manual, aided, and automatic, which are used when the MTR system is in the test condition. The automatic mode is always used during normal operation of the MTR system.

***Caution:* Do not allow the antenna to drive into the elevation stops.**

(1) When operating in the manual mode, the TEST switch is set to TEST and the elevation MAN—AID—AUTO switch is set to MAN. The elevation handwheel is then rotated either clockwise or counterclockwise to position the track antenna reflector assembly (2, fig. 44) to the desired elevation angle. When the TEST switch is set to TEST, and the LAUNCHER ACQUIRE switch is operated, the track antenna reflector assembly automatically slews to the elevation angle of the designated missile or to the flight simulator group if a missile has not been designated.

(2) When operating in the aided mode, the TEST switch is set to TEST, and the elevation MAN—AID—AUTO switch

is set to AID. When the elevation MAN—AID—AUTO switch is set to AID and the elevation handwheel is rotated and then released, the elevation angle of the missile, as indicated on the elevation dial, continues to increase or decrease. The direction and rate at which the elevation angle continues to increase or decrease remain the same as they were at the time the elevation handwheel was released. This direction and rate continue until the elevation MAN—AID—AUTO switch is set to MAN or AUTO, or until the elevation handwheel is rotated in the opposite direction.

(3) When operating in the automatic mode, the TEST switch is set to TEST, and the elevation MAN—AID—AUTO switch is set to AUTO. The MTR system locks on and automatically tracks the missile in elevation.

e. Missile Selection Control.

(1) *Automatic missile selection.* During normal operation the type missile information corresponding to the setting of the MISSILE switch and MISSION switch on the battery signal panel-indicator is transmitted to the launching area. The launching area personnel then designate the missile to be fired. Operation of the equipment in the launching area is presented in TM 9-1440-250-10.

(2) *Local missile selection.*

(*a*) When operating in the local missile selection mode, the LOCAL DESIGNATE switch on the missile track indicator must be set to the on (up) position. Launching sections can then be designated by operating any one of four SECTION switches. The designated section is indicated by illumination of the corresponding SECTION indicator light. After a section has been designated, a launcher can be designated by operating any one of the four LAUNCHER switches. The launcher designated is indicated by illumination of the corresponding LAUNCHER indicator light.

(*b*) When the MTR system is conditioned for local operation and the TEST RESPONDER switch is depressed, the TEST RESPONDER indicator light illuminates, indicating the flight simulator group is designated instead of a missile.

(*c*) If the MTR system is conditioned for local missile selection and the computer is conditioned for either action or tracking test, the MTR system slews to the azimuth, elevation, and range of either the designated missile or the flight simulator group, whichever is designated, when the LAUNCHER ACQUIRE switch is operated.

f. Magnetron Frequency Control. The frequency controls and indicators of the MTR magnetron are the FREQUENCY switch, TUNE-SLEW switch, FREQUENCY meter, and the OFF FREQ indicator light on the missile track control power supply. When the TUNE-SLEW switch is set to the SLEW position, the FREQUENCY meter indicates on the SLEW scale, and the FREQUENCY switch operates to increase or decrease magnetron frequency at a slew (fast) rate. The SLEW scale of the FREQUENCY meter is marked with positions 5 through 1, which represent tuned cavities that may be used in the MTR system. The magnetron frequency is changed at a slew (fast) rate until the FREQUENCY meter indicates the preselected tuned cavity that is in use. When the TUNE-SLEW switch is set to the TUNE position, the FREQUENCY meter indicates on the TUNE scale and the FREQUENCY switch operates to increase or decrease magnetron frequency at a tune (slow) rate. The TUNE scale of the FREQUENCY meter has a white section which represents the resonant frequency of the preselected tuned cavity. When the magnetron operating frequency is not the same as the tuned cavity resonant frequency, the FREQUENCY meter indicates to the right of the white section. When the magnetron operating frequency is the same as the tuned cavity resonant frequency, the

FREQUENCY meter indicates in the white section. The OFF FREQ light illuminates when the magnetron operating frequency is not the same as the tuned cavity resonant frequency. If the magnetron frequency is changed when the magnetron is functioning, it may be necessary to rotate the HV SUPPLY knob to maintain proper magnetron current on the MAGNETRON meter.

g. Missile High Voltage Control. Missile high voltage control involves observations and operations necessary to control high voltage to the range indicator (10, fig. 30) and the magnetron of the transmitting system of the MTR system. The controls and indicator lights used to perform these operations are discussed in (1) and (2) below.

(1) *Indicator high voltage control.* When the IND HV switch is set to the on (up) position, the IND HV indicator light illuminates and high voltage is applied to the range indicator. The high voltage causes the cathode-ray tube of the range indicator to illuminate, provided the INTENSITY knob is properly adjusted.

(2) *Magnetron high voltage control.*

Caution: **Safety devices are built into the magnetron high voltage circuits to insure proper energizing, but these safety devices may fail; therefore, energize the MTR system equipment in the manner prescribed in table 85 to prevent damage to, or possible failure of, the equipment.**

(*a*) When illuminated, the HV SUPPLY—READY indicator light on the missile track control power supply indicates that the necessary time delay has elapsed, and high voltage may be applied to the magnetron of the MTR system, provided the HV SUPPLY knob is set to START.

(*b*) When the HV SUPPLY—ON switch is depressed, the HV SUPPLY—ON indicator light illuminates, and the HV SUPPLY—READY indicator light extinguishes. The current of the magnetron is controlled by the HV SUPPLY knob. The HV SUPPLY knob is rotated clockwise until the correct operating magnetron current is indicated on the MAGNETRON meter. The pointer of the MAGNETRON meter may fluctuate, indicating arcing within the magnetron. When this occurs, turn the HV SUPPLY knob counterclockwise until the arcing ceases.

Caution: **If the pointer of the MAGNETRON meter continues to fluctuate, turn the HV SUPPLY knob to START.**

(*c*) The HV SUPPLY knob is rotated counterclockwise to the START position, and the HV SUPPLY—OFF switch is depressed to deenergize the magnetron. The HV SUPPLY—READY indicator light illuminates, and the HV SUPPLY—ON indicator light extinguishes.

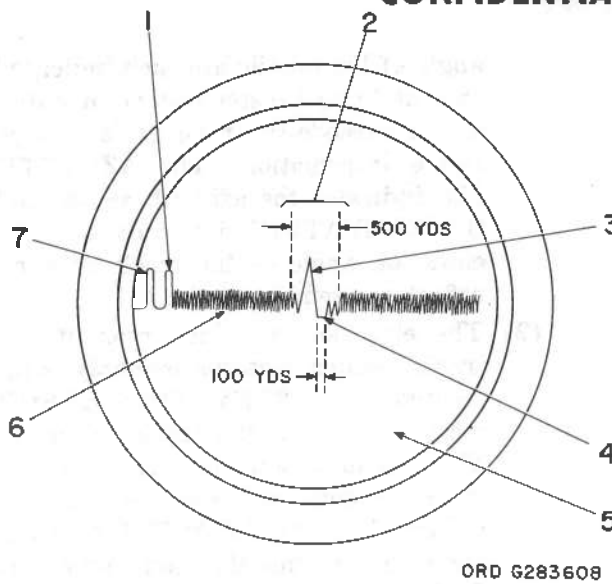
127 (C). Description of Missile Tracking Radar Presentation

The MTR presentation indicates missile range, azimuth, and elevation information. The range information is presented by means of a range indicator. The azimuth and elevation information is presented by means of azimuth and elevation dials, and azimuth and elevation error meters.

a. Range Indicator Presentation. The range indicator presentations are presented by means of a cathode-ray tube and a range indicator dial. The type of presentation is determined by the setting of the IMAGE SPACING switch on the range indicator (10, fig. 30) on the missile radar control console. The basic range indicator presentation is shown in figure 119 and discussed in (1) and (2) below. The range indicator is adjusted or varied by the four controls discussed in (3) below.

Note. The key numbers shown in parentheses in (1) below refer to figure 119, unless otherwise indicated.

(1) *Presentation with the IMAGE SPACING switch set to the OFF or NOR position.* The range indicator presentation is identical when the IMAGE SPACING switch is set to



1—Transmitted pulse
2—500-yard expanded sweep
3—Missile "pip" (missile transmitted signal)
4—100-yard range notch
5—Cathode-ray tube
6—Missile range trace (with noise)
7—Coder pulse

Figure 119 (U). Range indicator—presentation (U).

either OFF or NOR. The presentation consists of a coder pulse (7), a transmitted pulse (1), a 500-yard expanded sweep (2), and the 100-yard range notch (4), all superimposed on the missile range trace (6). The missile "pip" (3) becomes part of the presentation when a radar return signal or a missile transmitted signal is being received by the MTR system. The missile range trace, the missile "pip", and the four reference marks are described in (*a*) through (*e*) below.

(*a*) *Missile range trace.* The missile range trace extends across the face of the cathode-ray tube (5) and represents a maximum range of either 200,000 yards or 55,000 yards, depending upon the type missile to be used. The missile range trace can be adjusted to a minimum range of 40,000 and a maximum range of 200,000 yards when the MTR system is conditioned for a NIKE-HERCULES engagement, or the missile range trace can be adjusted to represent any range from 10,000 to in excess of 52,000 yards when the MTR system is conditioned for a NIKE-AJAX engagement. The left side of the missile range trace represents 0 yards in range and the right side represents the maximum adjusted range. Superimposed on the missile range trace is noise that is reduced to a minimum when the MTR system is locked on the missile.

(*b*) *Transmitted pulse and coder pulse.* When the MTR system is conditioned for a NIKE-AJAX engagement, the coder pulse appears as a clearly defined pulse on the left side of the missile range trace and the transmitted pulse appears directly to the right of the coder pulse. When the MTR system is conditioned for a NIKE-HERCULES engagement, the coder pulse and the transmitted pulse appear defocused and intermixed on the left side of the missile range trace. The coder pulse indicates that the coder system of the MTR system is operating. The transmitted pulse represents 0 yards in range and signifies that the MTR system is transmitting. Neither pulse has an operational significance, but appears only because of inherent characteristics of the MTR system.

(*c*) *The 500-yard expanded sweep.* The 500-yard expanded sweep is displayed on the missile range trace. The 500-yard expanded sweep displays an expanded portion of the missile range trace for better definition of the missile "pip". The missile range, as represented by the range dial, is moved in or out by the rotation of the range handwheel, moving the 500-yard expanded sweep to the left or right as displayed on the missile range trace.

(*d*) *100-yard range notch.* The 100-yard range notch is centered within the 500-yard expanded sweep and moves

in or out in range as the 500-yard expanded sweep moves in or out in range. When the missile "pip" is in the 100-yard range notch, the track antenna reflector assembly (2, fig. 44) of the MTR system is pointing at the missile and the range unit is positioned to the range of the missile.

(e) *Missile "pip"*. The missile "pip" becomes part of the range indicator presentation when the track antenna reflector assembly of the MTR system is pointing at the missile and the range unit is positioned to the range of the missile. When the missile is being tracked, the missile "pip" appears as a raised vertical spike in the 100-yard range notch.

(2) *Presentation with IMAGE SPACING switch set to the SEL SIG position.* The range indicator presentation, with the IMAGE SPACING switch set to SEL SIG, consists of only the 500-yard expanded sweep section of the missile range trace. Otherwise, the presentation is the same as that shown when the IMAGE SPACING switch is set to either OFF or NOR. The presentation with the switch set to either OFF or NOR is discussed in (1) above.

(3) *Operation of controls affecting presentation.* The presentation on the range indicator is affected by four controls. For a discussion of these controls refer to table 46.

(4) *Range dial.* The range dial indicates the range represented by the range system of the MTR system. When the missile "pip" of the range indicator presentation is centered within the 100-yard range notch, the range dial indicates the slant range to the missile. The dial is graduated from 0 to 200,000 yards in increments of 10 yards.

b. Azimuth and Elevation Presentation.

(1) The azimuth angle and the elevation angle of the missile are each indicated on a dial and a meter instead of a dial and a cathode-ray tube as is missile range information. The AZIMUTH dial indicates the azimuth angle, and the ELEVATION dial indicates the elevation angle of the track antenna reflector assembly (2, fig. 44).

(2) The elevation pointing error of the track antenna reflector assembly is indicated on the ELEVATION ERROR meter on the missile track indicator. The azimuth pointing error of the track antenna reflector assembly is indicated on the AZIMUTH ERROR meter on the missile track indicator. Both meters are zero centered. An indication either side of zero indicates a pointing error. For example, an indication to the left on the ELEVATION ERROR meter occurs when the track antenna reflector assembly is pointing below the missile.

128 (U). Radar Test Set Group Control

The radar test set group (fig. 47) has no tactical function in the Improved NIKE–HERCULES System. The radar test set group is used for testing and alining the TTR, TRR, and MTR systems. Controls necessary for remote operation of the radar test set are on the missile control-indicator group (12, fig. 30) on the missile radar control console and on the target test control (15, fig. 32) on the radar control console. To apply primary power to the radar test set, both the MAIN POWER switch on the radar power control-indicator, and the AC POWER switch on the radar test set must be set to ON. The AC POWER switch is normally set to ON so that the application of primary power to the radar test set can be controlled from the trailer mounted tracking station. To operate the radar test set from the trailer mounted tracking station, the TEST switch on the radar test set is set to REMOTE and the PWR METER CAL switch is set to MEAS. Local antenna control is provided at each of the antenna-receiver-transmitter groups. The MTR and TTR are provided with local antenna controls and the TRR is provided with an an-

tenna test set. The controls are used for positioning the antenna in elevation and azimuth coordinates during test and alinement procedures. Operation of the radar test set from the target radar control console and from the missile radar control console is given in *a* and *b* below.

Note. Operation of the TRR is identical in azimuth and elevation to the TTR. Therefore, follow the procedures outlined in *a* below for alining and checking the TRR.

a. Operation from the Target Radar Control Console—Target Track Radar. To operate the radar test set from the target radar control console, the track antenna reflector assembly (2, fig. 44) associated with the TTR system must be positioned to the coordinates of the radar test antenna assembly (1, fig. 47). To position the track antenna reflector assembly, the azimuth handwheel and the elevation handwheel on the target antenna control group must be rotated until the elevation and azimuth dials indicate the correct coordinates.

(1) The radar test set generates a target test signal when the TEST switch on the target antenna control group is set to TEST and the TARGET—STANDBY—MISSILE switch on the missile control-indicator group is set to TARGET. The RECEIVER TEST indicator light on the target test control illuminates when the TARGET—STANDBY—MISSILE switch is set to TARGET. The magnitude of the target test signal is controlled by the SIGNAL LEVEL knob on the target test control. The setting of the SIGNAL LEVEL knob is indicated on the SIGNAL LEVEL dial. The dial is graduated from 0 to 35 db in increments of 1 db. The frequency of the target test signal can be varied by the FREQUENCY knob. Normally, the frequency is set to a definite value and is not changed. The range represented by the target test signal can be increased or decreased by setting the RANGE—SLEW switch to IN or OUT. The RANGE—TRIM knob is used for fine adjustment of the range as represented by the target test signal.

(2) The target test signal is removed when the TARGET — STANDBY — MISSILE switch on the missile control-indicator group is set to either STANDBY or MISSILE, or when the TEST switch is set to the off (down) position. This also extinguishes the RECEIVER TEST indicator light.

b. Operation from the Missile Radar Control Console—Missile Track Radar. To operate the radar test set from the missile radar control console, the track antenna reflector assembly (2, fig. 44) associated with the MTR system must be positioned to the coordinates of the radar test antenna assembly (1, fig. 47). To position the track antenna reflector assembly to these coordinates, the azimuth handwheel and the elevation handwheel on the missile track control drawer are rotated until the AZIMUTH dial and the ELEVATION dial on the missile track indicator indicate the correct coordinates.

(1) The radar test set generates a missile test signal when the TEST switch on the missile track control drawer is set to TEST and the TARGET—STANDBY—MISSILE switch on the missile control-indicator group is set to MISSILE. The RECEIVER TEST indicator light on the missile control-indicator group illuminates when the TARGET — STANDBY — MISSILE switch is set to MISSILE. The magnitude of the missile test signal is controlled by the SIGNAL LEVEL knob. The setting of the SIGNAL LEVEL knob is indicated on the SIGNAL LEVEL dial. The dial is graduated from 0 to 35 db in increments of 1 db. The range represented by the missile test signal may be increased or decreased by setting the RANGE—SLEW switch to IN or OUT. The RANGE—TRIM knob is used for fine adjustment of the range represented by the missile test signal.

(2) The missile test signal is removed when the TARGET—STANDBY—MISSILE switch on the missile control-indicator group is set to either TARGET or STANDBY, or when the

TEST switch is set to the off (down) position. This also extinguishes the RECEIVER TEST indicator light.

Note. **For local antenna control, antenna test set control, and control of the radar test set group, refer to TM 9–1430–251–20/2.**

Section V (C). COMPUTING, PLOTTING, AND RECORDING EQUIPMENT CONTROL

129 (C). Computing Equipment Control

During a normal engagement, the operation of the computer system is automatic and functionally related to the operation of the TTR, TRR, and MTR systems and launching equipment. The TTR and TRR systems supply the computer system with target position information. The MTR system supplies the computer system with missile position information. The computer supplies steering and burst orders to the missile by way of the MTR system. The computer also sends gyro azimuth (A_G) information to the missile before firing. The operation of the computer system, as performed by the operator, is automatic except for manually setting in data and performing tests to insure proper operation of the computer system before firing.

a. Description of Dial and Meter Indications.

(1) *CLIMB ANGLE dial and GYRO AZIMUTH dial.*

(*a*) The CLIMB ANGLE dial on the servo computer assembly indicates the computed angle of the missile, and the GYRO AZIMUTH dial indicates the A_G angle of the predicted intercept point. Both dials indicate mils and are identically graduated. Each dial has an upper scale graduated from 0 to 6,400 mils with marks at 100-mil intervals and numerals at 200-mil intervals. Each dial also has a lower scale graduated from 0 to 100 mils with marks at 5-mil intervals and numerals at 10-mil intervals. The stationary diamond-shaped marking on each dial is the index.

(*b*) To obtain the indicated value, the individual markings on the two scales must be combined, using the thousand and hundred digits from the upper scale and the ten and unit digits from the lower scale. The upper scale is read by using the mark directly opposite the index. If the index points between two marks, the smaller number is used. The lower scale is read in a similar way, with the exception that if the index points between two marks, the unit digit must be estimated.

(2) *TIME TO INTERCEPT dial.*

(*a*) The TIME TO INTERCEPT dial indicates in seconds the time remaining until intercept. It has two scales and a vernier. The upper scale indicates time in seconds and is graduated from 0 to 200 seconds with marks at 1-second intervals and numerals at 10-second intervals. The lower scale is graduated from 0 to 1 with marks at 0.01-second intervals and numerals at 0.1-second intervals. The long vertical mark at the left of the vernier is an index followed to the right by 10 divisions. The vernier is used with the lower scale to determine time in thousandths of a second.

(*b*) To obtain the indicated value, the individual markings on both scales and the vernier must be combined. The upper or lower scales are read by using the mark on each scale directly opposite the index. If the index points between two marks, the smaller indication is used. The upper and lower scales combined indicate seconds remaining until intercept. To obtain the third digit to the right of the decimal point (thousandths), it is necessary to determine which mark on the vernier is in closest alinement with a division on the lower scale.

(3) *TURN ANGLE dial and BALLISTIC EL dial.*

(a) The TURN ANGLE dial indicates the computer turn angle of the missile, and the BALLISTIC EL dial indicates the ballistic elevation angle of the predicted intercept point. Both dials indicate mils and are identically graduated. Each dial has an upper scale graduated from −1,600 mils to +1,600 mils with marks at 100-mil intervals and numerals at 200-mil intervals, and a lower scale graduated from 0 to 100 with marks at 5-mil intervals and numerals at 10-mil intervals. Values indicated on the black portions of the upper and lower scales to the right of zero are positive. Values indicated on the red portion of the upper and lower scales to the left of zero are negative. The stationary diamond-shaped marking on each dial is in the index.

(b) To obtain the indicated value, the individual markings of the same color on the two scales must be combined, using the thousand and hundred digits from the upper scale. The upper scale is read by using the mark directly opposite the index. If the index points between two marks, the smaller indication is used. The lower scale is read in a similar way, with the exception that if the index points between two marks, the unit digit must be estimated.

(4) *VELOCITY CORRECTION dial.* The VELOCITY CORRECTION dial indicates the percent velocity correction necessary to compensate for the decrease in missile velocity after motor burnout. The scale is graduated from 0 to 50 percent with marks every 0.2 percent and numerals every 1 percent.

(5) *TRANSIT TIME dial.*

(a) The TRANSIT TIME dial indicates the time required after missile warhead detonation for the warhead destructive force to reach its maximum radius. The dial has a scale and a vernier. The scale is graduated from 0 to 16 seconds with marks every 0.1 second and numerals every 0.5 second. The 0 and arrow at the left of the vernier serve as an index followed to the right by 10 divisions. The vernier is used with the upper scale to determine transit time in hundredths of a second.

(b) To obtain the indicated value, the individual markings on the scale and the vernier must be combined, using the unit and ten digits from the scale and the hundred digits from the vernier. The scale is read by using the mark directly opposite the index. If the index points between two marks, the smaller indication is used. The vernier is read by determining which mark on the vernier is in closest alinement with a division on the scale.

(6) *PRESENT TARGET ALTITUDE meter.* The PRESENT TARGET ALTITUDE meter on the tactical control-indicator indicates the present altitude of the tracked target. This meter is graduated from 0 to 100,000 feet in increments of 2,000 feet with numerals at 20,000 feet intervals.

(7) *GYRO AZIMUTH indicator.* The GYRO AZIMUTH indicator on the tactical control-indicator indicates the gyro azimuth (A_G) angle of the predicted intercept point. This indicator is graduated from 0 to 64 representing 0 to 6,400 mils in increments of 50 mils with numerals at 400-mil intervals.

(8) *TARGET GROUND SPEED meter and MISSILE SPEED meter.*

(a) *TARGET GROUND SPEED meter.* The TARGET GROUND SPEED meter on the tactical control-indicator indicates the ground speed of the tracked target from 0 to 1,500 knots in increments of 100 knots.

(b) *MISSILE SPEED meter.* The MISSILE SPEED meter on the tactical control-indicator indicates the mis-

sile air speed from 0 to 3,000 knots in increments of 100 knots. Inherent characteristics of the equipment cause the MISSILE SPEED meter to indicate between 350 and 410 knots before the missile flight.

b. Computer Condition Switch and Related Controls and Indicators.

(1) The COMPUTER CONDITION switch on the computer control-panel is a five-position rotary switch which permits selection of the mode of operation to be performed by the computer system. The five positions of the switch are ACTION, STAND BY, TRACKING, STEERING, and PRE LAUNCH & INITIAL TURN.

(*a*) When the COMPUTER CONDITION switch is set to ACTION, the computer system is fully energized and conditioned for an engagement or for a performance of certain dynamic checks. For a discussion of these checks, refer to TM 9-1430-251-20/2. During an actual engagement, with the COMPUTER CONDITION switch set to ACTION, the computer system starts to solve the fire control problem as soon as the TRACKED switch on the target antenna control group is depressed, indicating that the TTR and TRR systems are tracking the target in azimuth, elevation, and range.

(*b*) When the COMPUTER CONDITION switch is set to STAND BY, the computer system is partially energized and is in a state of readiness. This state of readiness permits partial operation of certain computer system components, reduces wear, and permits minimum time to condition the computer system for an engagement. The COMPUTER CONDITION switch should always be set to STAND BY, unless an engagement or test demands that it be set to some other position.

(*c*) When the COMPUTER CONDITION switch is set to TRACKING, the computer system is partially energized and is conditioned for performance of certain periodic checks. For a discussion of these checks, refer to TM 9-1430-251-20/2. In this condition, the computer system receives position information from the TTR, TRR, and MTR systems.

(*d*) When the COMPUTER CONDITION switch is set to STEERING, the computer system is partially energized and is conditioned to check the operation of the steering section of the computer system, using eight built-in static test problems. For a discussion of these static test problems, refer to TM 9-1430-251-20/2. When the COMPUTER CONDITION switch is set to STEERING, the desired static test problem can be introduced into the computer system by rotating the STATIC TEST—STEERING switch on the computer control-panel to the position corresponding to the problem desired.

(*e*) When the COMPUTER CONDITION switch is set to PRE LAUNCH & INITIAL TURN, the computer system is partially energized and is conditioned to check the operation of the prelaunch and initial turn sections of the computer system, using the eight built-in static test problems. The switch is also set to this position to perform certain altitude plotting board (8, fig. 22) and horizontal plotting board (21, fig.22) checks and adjustments. For a discussion of the built-in static test problems and the plotting board checks and adjustments, refer to TM 9-1430-251-20/2. The eight problems are introduced into the prelaunch and initial turn sections by using the STATIC TEST—PRE LAUNCH & INITIAL TURN switch on the computer control-panel.

(2) The settings of the COMPUTER CON-

DITION switch and the TARGET MISSILE switch determine the type of information displayed on the ACCELERATION, VELOCITY AND POSITION DIFFERENCE—G_T meter; ACCELERATION, VELOCITY AND POSITION DIFFERENCE—X, G_Y meter; and ACCELERATION, VELOCITY AND POSITION DIFFERENCE—Y, G_P meter. The information displayed on these meters is used in checking the performance of the computer system. For a discussion of these checks, refer to TM 9-1430-251-20/2.

c. Manually Set In Data Dials.

(1) *Parallax controls and dials.* The parallax knobs and dials on the computer control-panel adjust and indicate, respectively, the distance in yards the missile track antenna-receiver-transmitter group and the center of the launching area are from the target track antenna-receiver-transmitter group. The parallax circuits associated with these knobs electrically position the missile track antenna-receiver-transmitter group, and the launching area to the same coordinates as the target track antenna-receiver-transmitter group. The parallax dials must be set to the values listed on the PARALLAX DATA RECORD plate on the computer control-panel for the Improved NIKE-HERCULES System to operate properly during an engagement.

(2) *Burst time bias control and dial.* The BURST TIME BIAS knob and dial behind the computer control-panel (fig. 19) adjust and indicate, respectively, the time before computed intercept at which the computer system must issue the burst order. The burst order must be issued at a predetermined time to overcome fixed delays inherent in the computer system, the MTR system, and the missile. The BURST TIME BIAS dial is graduated from 0 to 200 milliseconds in increments of 2 milliseconds.

(3) *Height of site control and dial.* To avoid instability of the missile at high altitude, the Improved NIKE-HERCULES System must have a means of determining missile altitude so that the G_Y and G_P fin orders sent to the missile can be altered to fit the particular situation. The HT OF SITE knob behind the computer control-panel (fig. 18) can be electrically adjusted to represent the altitude of the TTR system above mean sea level. From this reference, the computer system alters the fin orders. The HT OF SITE dial indicates the setting of the HT OF SITE knob from 0 to 6,000 feet in increments of 100 feet.

(4) *Final dive time and height displace controls and dials.* The FINAL DIVE TIME knob and dial adjust and indicate, respectively, the length of time before the apparent time-to-intercept that the computer system issues final dive orders during a surface-to-surface engagement. The FINAL DIVE TIME dial is graduated from 0 to 25 seconds in increments of 0.2 second. The HT DISPLACE knob and dial adjust and indicate, respectively, the altitude of the displaced aiming point during a surface-to-surface engagement. The HT DISPLACE dial is graduated from 0 to 100,000 feet in increments of 1,000 feet.

d. Computer-Overload Indicator Lights. A bank of 10 AMPLIFIER UNBALANCE indicator lights on the computer control-panel flicker when power is applied to the computer system, but should extinguish shortly thereafter. Steady illumination of continued flickering of one or more of these indicator lights indicates trouble in the associated amplifier group. The COMPUTER—OVERLOAD indicator light on the tactical control-indicator (11, fig. 22) of the battery control console illuminates or flickers constantly when trouble exists in any one or more of the computer amplifier groups. If trouble is indicated an organizational maintenance-technician should be notified.

130 (C). Plotting Board Presentations and Control

The horizontal plotting board (21, fig. 22) and the altitude plotting board (8, fig. 22) are electromechanical devices which automatically plot information supplied by the computer. During surface-to-air, surface-to-air low altitude, and surface-to-surface missions, the plotting boards record target, missile, and intercept point position data. During radar bomb scoring missions, only the horizontal plotting board is used, and it records continuous target (bomber) position information. The plotting paper is contained in a roll at the left side of each plotting board. Before operating, check both plotting boards for clean plotting paper. If the paper is not clean, clean paper should be pulled over the transparent plastic backboard of each plotting board (8 and 21, fig. 22). Illumination from behind each backboard makes the grid markings visible through the paper. Each plotting board is equipped with electrically controlled right and left plotting pens.

a. Horizontal Plotting Board Presentation.

(1) The horizontal plotting board (21, fig. 22) provides a means for automatically plotting a plan view of the azimuth and range of the target and missile throughout the entire engagement. The backboard of the horizontal plotting board is marked with 20 concentric circles, representing twenty 10,000-yard range circles, and 32 radial lines, indicating azimuth. The twenty 10,000-yard circles extend from 0 range at the center to 200,000 yards at the outer circle. The range circles are numerically graduated from 0 to 200, with every fifth circle numbered. Each radial line represents 200 mils in azimuth, and every other line is numbered. The origin of the range and azimuth coordinates displayed by the horizontal plotting board represents the location of the target track antenna-receiver-transmitter group. One pen of the horizontal plotting board plots the target position throughout the engagement. The other pen plots the predicted intercept point during the prelaunch phase, and thereafter plots the missile position. If the pens touch each other, an interchange feature causes the pen which is plotting target data to begin plotting missile data, and the pen which is plotting missile data to begin plotting target data.

(2) A typical engagement plot by the horizontal plotting board is displayed in figure 120. The display is inked on paper and contains three plots: a plot showing the predicted intercept point (point A to point E), a plot showing the present position of the missile (point D to point C), and a plot showing present position of the target (point B to point C). Timing marks appear on each plot at approximately 10-second intervals. TARGET—MISSILE plot indicators at the lower left and lower right corners of the board indicate whether the corresponding pen is plotting target position or missile position information.

(3) During the prelaunch phase, the horizontal plotting board continuously plots the present position of the target (point B to the fire mark) and the position of the predicted intercept point (point A to point E). Location of the predicted intercept point is based on the assumption of an immediate fire.

(4) When the fire order was transmitted, the target was at approximately 135,000 yards, and the predicted intercept point was at approximately 95,000 yards. The fire mark appears at about 135,000 yards and 95,000 yards as a short mark to the right of the trace. When the fire order was transmitted, the recorder pen plotting the predicted intercept point returned to approximately the center of the plotting board (point D) and began to plot the position of the missile in the horizontal plane. Target and missile plots continued until target interception occurred at the intersection of the two plots (point C).

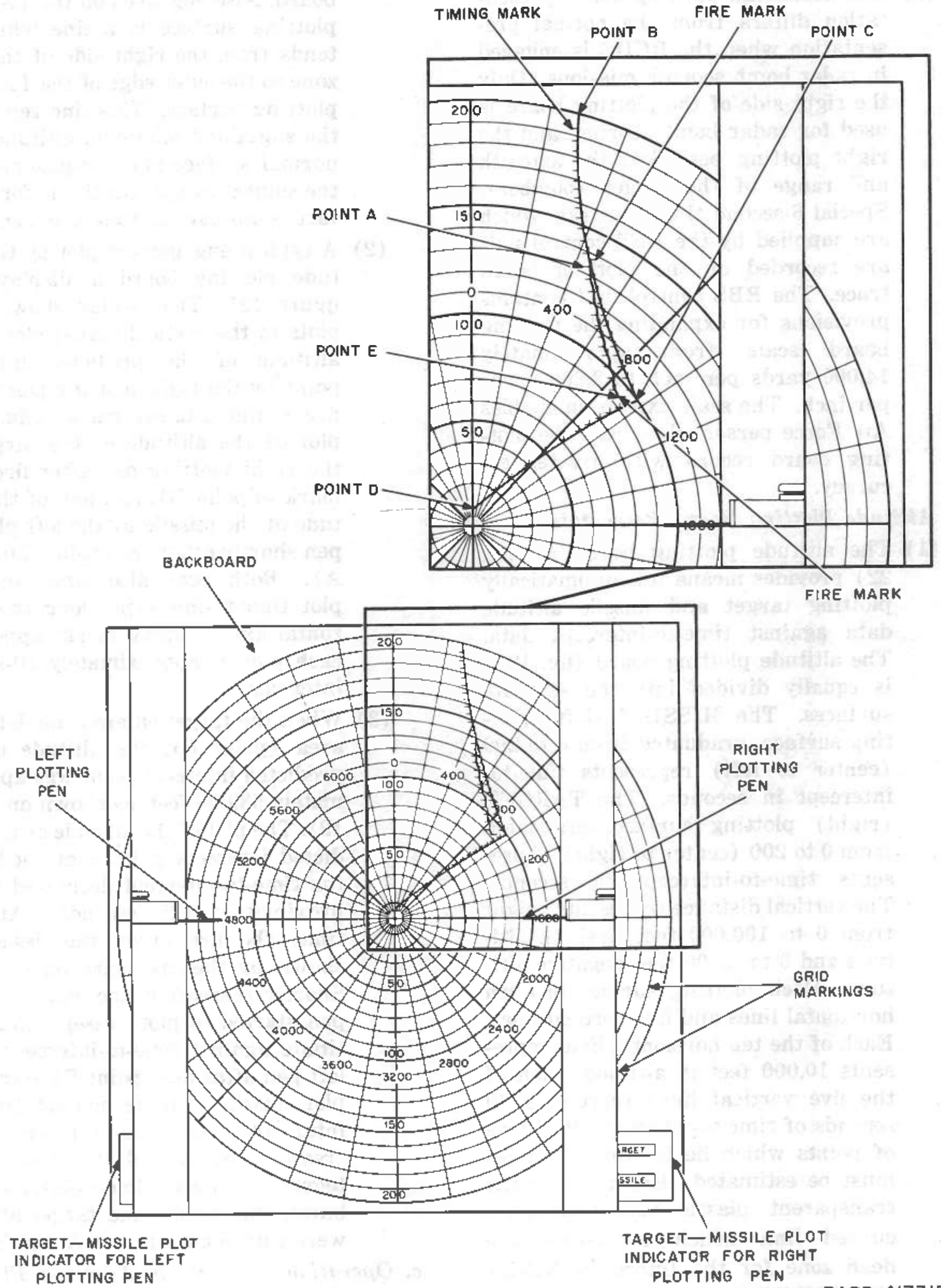


Figure 120 (C). Horizontal plotting board—engagement plot—typical (U).

(5) The horizontal plotting board presentation differs from the normal presentation when the RCDC is engaged in radar bomb scoring missions. Only the right side of the plotting board is used for radar bomb scoring, and the right plotting pen plots the azimuth and range of the target (bomber). Special 6-second timing marks, which are supplied by the RBS control unit are recorded on the plotting board trace. The RBS control unit contains provisions for expanding the plotting board scale from approximately 14,000 yards per inch to 3,200 yards per inch. The scale expansion enables Air Force personnel to read the plotting board record with greater accuracy.

b. Altitude Plotting Board Presentation.

(1) The altitude plotting board (8, fig. 22) provides means for automatically plotting target and missile altitude data against time-to-intercept data. The altitude plotting board (fig. 121) is equally divided into the separate surfaces. The MISSILE (left) plotting surface, graduated from 0 to 200 (center to left) represents time-to-intercept in seconds. The TARGET (right) plotting surface, graduated from 0 to 200 (center to right), represents time-to-intercept in seconds. The vertical distance represents height from 0 to 100,000 feet positive altitude and 0 to 5,000 feet negative altitude. Each plotting surface has ten horizontal lines and five vertical lines. Each of the ten horizontal lines represents 10,000 feet in altitude; each of the five vertical lines represents 40 seconds of time-to-intercept. Positions of points which lie between the lines must be estimated. Engraved on the transparent plastic backboard is a curved line which represents the dead zone for the Improved NIKE-HERCULES System. This curved line is shown as part of the TARGET plotting surface on the altitude plotting board. Also engraved on the TARGET plotting surface is a line which extends from the right side of the dead zone to the outer edge of the TARGET plotting surface. This line represents the suggested minimum altitude for a normal surface-to-air engagement, or the suggested upper altitude for a surface-to-air low altitude engagement.

(2) A typical engagement plot by the altitude plotting board is displayed on figure 121. The display shows three plots in the vertical plane: plot of the altitude of the predicted intercept point by the right plotting pen before fire (point C to fire mark) (fig. 121), plot of the altitude of the target by the right plotting pen after fire (fire mark to point B), and plot of the altitude of the missile by the left plotting pen shortly after fire (point E to point A). Both pens also simultaneously plot time-to-intercept along the horizontal axis. Timing marks appear on each plot at approximately 10-second intervals.

(3) When the target entered the defended area (point C), the altitude of the predicted intercept point was approximately 53,000 feet, as shown on figure 121. The plot of the altitude of the predicted intercept point continued until the time-to-intercept decreased to approximately 125 seconds. At this time, the fire order was issued as shown by the fire mark on the plot. Shortly thereafter, the right plotting pen started to plot present target altitude against time-to-intercept. The left pen after fire (point E) started to plot missile altitude against time-to-intercept. As time-to-intercept decreased, the two plots moved closer together. At zero time-to-intercept, or burst, the missile and target altitude were coincident (points A and B).

c. Operation of Controls Affecting Plotting Board Operation. The plotting pens of the horizontal plotting board (21, fig. 22) and the altitude plotting board (8, fig. 22) are con-

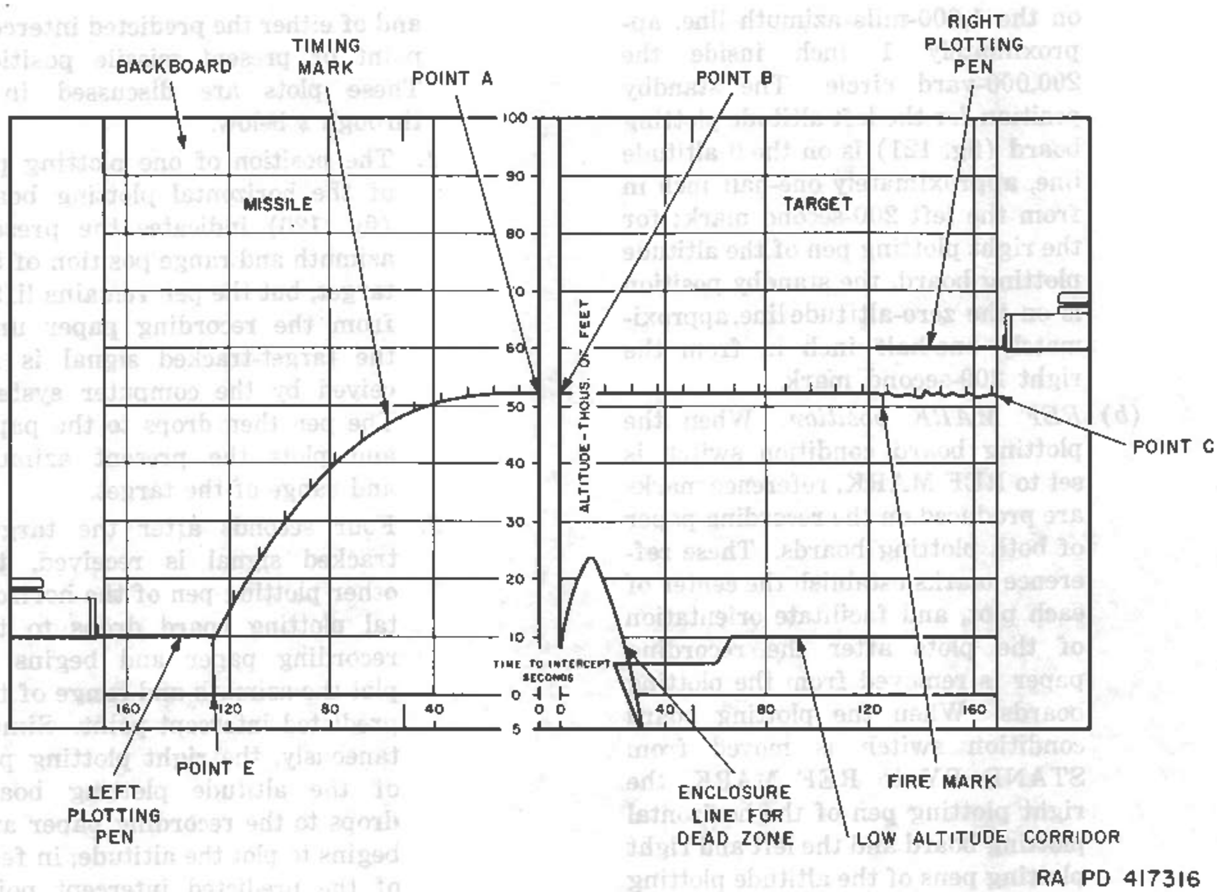


Figure 121 (C). Altitude plotting board—engagement plot—typical (U).

trolled by the plotting board condition switch, the PEN LIFT switch, and the PEN INTERCHANGE switch on the tactical control-indicator. Power is applied to the plotting board circuits when the COMPUTER POWER switch, PLATE VOLTS switch, and SERVO DC switch on the computer power control panel are set to ON.

Note. If the COMPUTER CONDITION switch is set to STAND BY, the plotting pens of the altitude plotting board and the horizontal plotting board continue to operate for an indeterminate time of ½ to 10½ minutes as determined by the computer standby interval timer inside the computer power supply group. At the end of this interval, the plotting pens cease to operate. To restore the plotting pens to operation, the COMPUTER CONDITION switch must be set momentarily to some position other than STAND BY.

(1) *Plotting board condition switch.* The plotting board condition switch (1, fig. 53) is a five-position rotary switch which provides means for selecting the mode of operation to be performed by the plotting pens (figs. 120 and 121) of both plotting boards. The five positions of the switch are: REF MARK, STAND BY, OPERATE, PLOT, and TEST. The function of each switch position is described in (*a*) through (*e*) below.

(*a*) *STAND BY position.* When the plotting board condition switch is set to STAND BY, the plotting pens on the two plotting boards lift from the recording paper and assume the standby position. The standby position for the left plotting pen on the horizontal plotting board (fig. 120) is on the 4,800-mil azimuth line, approximately 1 inch inside the 200,000-yard circle. The standby position for the right plotting pen of the horizontal plotting board is

on the 1,600-mils azimuth line, approximately 1 inch inside the 200,000-yard circle. The standby position for the left altitude plotting board (fig. 121) is on the 0 altitude line, approximately one-half inch in from the left 200-second mark; for the right plotting pen of the altitude plotting board, the standby position is on the zero-altitude line, approximately one-half inch in from the right 200-second mark.

(*b*) *REF MARK position.* When the plotting board condition switch is set to REF MARK, reference marks are produced on the recording paper of both plotting boards. These reference marks establish the center of each plot, and facilitate orientation of the plots after the recording paper is removed from the plotting boards. When the plotting board condition switch is moved from STAND BY to REF MARK, the right plotting pen of the horizontal plotting board and the left and right plotting pens of the altitude plotting board draw horizontal lines on the recording paper from their standby positions to the center of their respective coordinates. When the plotting board condition switch is returned to STAND BY, the three plotting pens draw a short vertical line on the recording paper, then lift and return to their respective standby positions. During the time the plotting board condition switch is positioned from STAND BY to REF MARK to STAND BY, the left plotting pen of the horizontal plotting board remains at its standby position.

(*c*) *PLOT position.* When the COMPUTER CONDITION switch is set to ACTION and the plotting board condition switch is set to PLOT, the plotting pens on both plotting boards produce an ink plot of the present computer target position, and of either the predicted intercept point or present missile position. These plots are discussed in *1* through *4* below.

1. The position of one plotting pen of the horizontal plotting board (fig. 120) indicates the present azimuth and range position of the target, but the pen remains lifted from the recording paper until the target-tracked signal is received by the computer system. The pen then drops to the paper and plots the present azimuth and range of the target.

2. Four seconds after the target-tracked signal is received, the other plotting pen of the horizontal plotting board drops to the recording paper and begins to plot the azimuth and range of the predicted intercept point. Simultaneously, the right plotting pen of the altitude plotting board drops to the recording paper and begins to plot the altitude, in feet, of the predicted intercept point against time-to-intercept in seconds.

3. The left plotting pen of the altitude plotting board remains lifted but indicates the time-to-intercept in seconds while moving horizontally along the 0 altitude line.

4. Approximately 3 seconds after the fire order is issued, the missile away circuits are energized, causing the left plotting pen of the altitude plotting board to drop and begin plotting the missile altitude in feet, against time-to-intercept in seconds. At the same time, the right plotting pen of the altitude plotting board stops plotting the altitude of the predicted intercept point and begins to plot the present target altitude, in feet, against time-to-intercept in seconds. One plotting pen of the horizontal plotting

board continues to plot the range and azimuth of the target, and the other plotting pen of the horizontal plotting board stops plotting the range and azimuth of the predicted intercept point, and begins to plot the range and azimuth of the missile.

(d) *OPERATE position.* When the plotting board condition switch is set to OPERATE, the plotting pens of both plotting boards remain lifted from the plotting surface, but indicate the same coordinates that are plotted when the plotting board condition switch is set to PLOT.

(e) *TEST position.* When the plotting board condition switch is set to TEST, the magnets of all four plotting pens are energized, causing the plotting pens to drop to the surface of the recording paper, and permitting a check of the magnet circuits of the plotting pens. The plotting board condition switch is usually set to TEST when the computer is conditioned for a test.

(2) *PEN LIFT switch.* When operated, the PEN LIFT switch on the tactical control-indicator causes the plotting pens on both the altitude plotting board and the horizontal plotting board to lift from the recording paper. The plotting pens are lifted to indicate a point of interest during an engagement, or to prevent the pens from tearing the recording paper. Lifting the pens results in discontinuity of the plot. The PEN LIFT switch functions only when the plotting board condition switch is set to PLOT.

(3) *PEN INTERCHANGE switch.* The PEN INTERCHANGE switch on the tactical control-indicator interchanges the input data to the plotting pens of the horizontal plotting board provided the COMPUTER CONDITION switch on the computer control-panel (fig. 18) is set to PRE LAUNCH & INITIAL TURN. The PEN INTERCHANGE switch is used primarily to check pen interchange circuits. The plotting pens interchange automatically when the plotting pens or plotting arms touch each other during normal operation. This automatic pen-interchange feature enables the horizontal plotting board to make a continuous plot in all directions.

131 (U). Early Warning Plotting Board

For information concerning the use of the early warning plotting board (fig. 20), refer to paragraph 32.

132 (U). Recording Equipment Control

a. General Operation of the Multichannel Data Recorder.

(1) The multichannel data recorder (6, fig. 23) produces a permanent record on light-sensitive paper, or film, by photographing light traces. For a detailed explanation of the information recorded by the multichannel data recorder, refer to TM 9-1430-250-20/3.

(2) Operator control of the multichannel data recorder is restricted to loading, selecting the mode of operation, energizing and deenergizing, and removing the record. The procedure to be followed in loading or removing a record from the multichannel data recorder is discussed in paragraph 186. The three modes of operation, signal-recording mode, alternate signal-recording mode, and test mode, are discussed in *b* through *d* below.

b. Signal–Recording Mode. The signal-recording mode of operation is used at all times except when tests are being performed on the multichannel data recorder, or when the multichannel data recorder is used during an equipment status other than red. To operate in this mode the OPERATE—TEST switch must be set to OPERATE. The multichannel data recorder is then energized by the signal-recording method, given in table 77.

(1) When operating in this mode, the multichannel data recorder starts recording as soon as the equipment

status switch (2, fig. 53) on the tactical control-indicator is set to RED, when a target has been designated. When the recording starts, the events in (*a*) through (*d*) below occur, provided a target has been designated.

(*a*) Sixteen galvanometer traces, in the form of red dots, appear on the direct trace monitoring screen (1, fig. 51).

(*b*) The LAMP FAILURE—T indicator light, LAMP FAILURE—1 indicator light, and LAMP FAILURE—2 indicator light illuminate to a faint glow.

Note. If one or more lamp failure indicator lights illuminate at a higher brilliance, it indicates that the corresponding recorder lamp has failed.

(*c*) The REC ON indicator light on the fuse and control panel (7, fig. 23) illuminates.

(*d*) The MOTOR ON indicator light illuminates, and the RECORD NUMBER counter advances to the next higher number. Both occur approximately 3 seconds after red equipment status is established if a target has been designated.

(2) When, during operation, it is desired to produce a zero trace on the recording paper, the GALVANOMETER ZERO switch is momentarily depressed. This removes all input signals from the multichannel data recorder and produces a zero reference trace on the record.

(3) The END OF PAPER indicator light on the fuse and control panel (7, fig. 23) should periodically be observed. This indicator light illuminates when 25 feet or less of recording paper remains on the supply drum (3, fig. 23).

Note. If the END OF PAPER indicator light illuminates while a record is being made, operation of the recorder may be continued until the end of the engagement.

(4) At the end of the recording period the record is removed from the multichannel data recorder and forwarded for photographic processing.

c. Alternate Signal-Recording Mode. The alternate signal-recording mode is used only when the multichannel data recorder is operated during an equipment status other than red. The differences between the alternate signal-recording mode, and the signal-recording mode, discussed in *b* above, are given in (1) and (2) below.

(1) During the alternate signal-recording mode, the OPERATE-TEST switch is set to TEST.

(2) The multichannel data recorder is energized by the alternate signal-recording method, given in table 78.

d. Test Mode. The test mode of operation is used when making calibration checks and adjustments on the multichannel data recorder. To operate in this mode, the multichannel data recorder is energized as given in table 79. For calibration checks and adjustments on the multichannel data recorder, refer to TM 9-1430-251-20/2.

Section VI (U). EQUIPMENT COOLING, HEATING AND LIGHTING EQUIPMENT CONTROL

133 (U). Equipment Cooling Control

Note. Operation of the equipment cooling system in the trailer mounted director station is identical to the operation of the equipment cooling system in the trailer mounted tracking station except for the location of the EQPT VENT switch (*a* below) and difference in the warning panels (*c* and *d* below).

The equipment cooling system provides filtered air to the cabinets and consoles of the trailer mounted director station to maintain a safe operating temperature for the electron tubes and other circuit components of the radar and computer equipment.

a. EQPT VENT Switch.

(1) The EQPT VENT switch on the rear of the acquisition power control panel (1, fig. 25) is used in conjunction with the MAIN POWER switch to control the application of power to the equipment cooling system in the trailer

mounted director station. Normally, the EQPT VENT switch is left in the on (up) position, permitting application of power to the equipment cooling system to be controlled by the MAIN POWER switch on the front of the acquisition power control panel.

(2) The EQPT VENT switch on the rear of the radar power control-indicator is used in conjunction with the MAIN POWER switch to control the application of power to the equipment cooling system in the trailer mounted tracking station. Normally, the EQPT VENT switch is left in the on (up) position, permitting application of power to the equipment cooling system to be controlled by the MAIN POWER switch on the front of the radar power control-indicator.

Note. The key numbers shown in *b*, *c*, and *d* below refer to figure 26, unless otherwise indicated.

b. Damper and Shutter Lever. The damper and shutter lever (11) is used to control the air intake and exhaust from the equipment cooling system. The damper and shutter lever should be positioned as prescribed in (1) through (3) below.

(1) When the outside air temperature is above 75°F, the damper and shutter lever (11) should be set to OPEN.

(2) When the outside air temperature is below 75°F, the damper and shutter lever (11) should be adjusted until approximately 75°F is maintained as indicated on the EXHAUST TEMPERATURE meter on the warning panel (12).

(3) In very cold climates, the damper and shutter lever (11) should be set to CLOSE until the EXHAUST TEMPERATURE meter indicates 75°F. The damper and shutter lever should then be adjusted to maintain an exhaust air temperature of approximately 75°F.

c. Warning Panel (Director Station Trailer).

Caution: **Do not allow temperature to rise above 130°F. If the warning buzzer sounds and the overheat indicator light illuminates, set damper and shutter lever (11) to OPEN. Under these conditions, only emergency operation of the equipment should be continued.**

The EXHAUST TEMPERATURE meter, the buzzer switch, the overheat indicator light, and the OPERATING INSTRUCTIONS plate are on the warning panel (12) and are used with the damper and shutter lever (11), to maintain the exhaust air temperature at a safe operating level below 130°F. The OPERATING INSTRUCTIONS plate gives instructions for adjusting the damper and shutter lever and for filter replacement, and explains the operation of the exhaust air overheat alarm.

d. Warning Panel (Tracking Station Trailer).

Caution: **Do not allow temperature to rise above 130°F. If the warning buzzer sounds or any of the overheat indicator lights illuminates, set damper and shutter lever (11) to OPEN. Under these conditions, only emergency operation of the equipment should be continued.**

The EXHAUST TEMPERATURE meter, the buzzer switch, system overheat indicator light, TTC OVERHEATED indicator light, RSG OVERHEATED indicator light, and the OPERATING INSTRUCTIONS plate are on the warning panel (12) and are used with the damper and shutter lever (11) to maintain the exhaust air temperature at a safe operating level below 130°F. The OPERATING INSTRUCTIONS plate gives instructions for adjusting the damper and shutter lever and for filter replacement, and explains the operation of the exhaust air overheat alarm.

134 (U). Heating Equipment Control

Note. The key numbers shown in parentheses in *a* through *c* below refer to figure 24.

Note. Operation of the heating equipment in the trailer mounted director station is identical to the operation of the heating equipment in the trailer mounted tracking station. Therefore, only operation of the heating equipment in the trailer mounted director station is discussed in this paragraph. For a detailed discussion of the heating equipment, refer to TM 9-6093-12. For emergency instructions of the heating equipment, refer to TM 9-2330-212-14.

a. HEATER Switch. When the HEATER switch, on the front of the personnel heater, is set to ON, the heater equipment is energized

for operation, and the white HEATER indicator light illuminates. When the HEATER switch is set to VENT, the ventilating air blower is energized for direct operation. The HEATER switch is set to OFF to deenergize the heating equipment and the ventilating air blower motor.

b. Blower Discharge Damper Control. When the blower discharge damper control lever (3) is set to HEAT, the heater ignition system and the fuel pump are prepared for operation and ventilating air is directed down through the heater. When the blower discharge damper control lever (3) is set to COOL, the heater ignition system and the fuel pump are disabled and ventilating air is directed up through the ceiling ducts.

c. Blower Intake Damper Control. The blower intake damper control lever (11) provides manual control of the fresh air port and the return air duct. The blower intake damper control lever should be positioned as prescribed in (1) through (3) below.

(1) When set to 1 FRESH AIR, the fresh air port is opened and the return air duct is closed to permit only fresh air to be delivered to the ventilating air blower.

(2) When set to 7 RECIRCULATE, the fresh air port is closed and the return air duct is opened to permit only air from the return air duct to be delivered to the ventilating air blower.

(3) When set to one of the intermediate positions, fresh air and air from the return air duct are delivered to the ventilating air blower in proportional amounts, depending upon the intermediate setting of the lever.

d. RESET Switch. When the RESET switch on the front panel of the personnel heater is depressed, the internal time delay switch is reset to restore the heater equipment to operation. If the amber RESET indicator light illuminates during heating equipment operation, the HEATER switch should be set to OFF. The fuel system should be checked for an empty tank, and the ignition system should be checked for proper connector contacts. The RESET switch may then be depressed to reset the internal time delay switch, thus restoring the heating equipment to operation.

e. AMMETER. The AMMETER, on the front panel of the personnel heater monitors the charging and discharging current of the 24-volt storage batteries.

135 (U). Lighting Equipment Control

a. Lighting Equipment Control in the Trailer Mounted Director Station.

(1) *Lighting equipment control during normal conditions.*

(*a*) During normal conditions, the BLACKOUT OVERRIDE switch on the trailer door light panel is set to ON. This causes the white incandescent lamps in the eight normal and emergency, and normal and blackout incandescent light fixtures (3 and 4, fig. 27) to illuminate, provided the ENTRANCE LIGHT OVERRIDE SWITCH and the CEILING LIGHTS switch are set to ON. Each incandescent light fixture contains one white incandescent lamp except the second and fifth normal and emergency incandescent light fixtures (4, fig. 27) from the trailer mounted director station entrance. These two normal and emergency incandescent light fixtures each contain two white incandescent lamps.

(*b*) With the CEILING LIGHTS switch on the trailer door light panel set to ON, all the white incandescent lamps in the eight normal and emergency, and normal and blackout incandescent light fixtures (3 and 4, fig. 27) illuminate at full brilliance. With the CEILING LIGHTS switch set to REMOTE, the brilliance of all white incandescent lamps but two is controlled by the CEILING LIGHTS switch and the CEILING LIGHTS knob on the tactical control-indicator (11, fig. 22) on the battery control console. The two lamps not controlled remotely consist of

one white incandescent lamp each in the second and fifth normal and emergency incandescent light fixtures (4, fig. 27) from the trailer mounted director station entrance. These two white incandescent lamps do not illuminate during remote operation. When the CEILING LIGHTS switch on the tactical control-indicator is set to BRIGHT, all white incandescent lamps except the two explained above illuminate at full brilliance. When the CEILING LIGHTS switch on the tactical control-indicator, is set to DIM, all white incandescent lamps except the two explained above may be adjusted to the desired brilliance by rotating the CEILING LIGHTS knob. The two white incandescent lamps not controlled remotely are for lighting during emergency conditions ((3) below).

(*c*) The ENTRANCE LIGHT OVERRIDE SWITCH may be set to OFF during normal conditions to extinguish the white incandescent lamp in the first normal and blackout incandescent light fixture (3, fig. 27) from the trailer mounted director station entrance while the other white incandescent lamps are illuminated.

(2) *Lighting equipment control during blackout conditions.* During blackout conditions the BLACKOUT OVERRIDE switch on the trailer door light panel is set to OFF, causing all white incandescent lamps in the six normal and blackout incandescent light fixtures (3, fig. 27) to extinguish and all blue incandescent lamps to illuminate. There is one blue incandescent lamp in each of the six normal and blackout incandescent light fixtures. The trailer door interlock switch (2, fig. 50) is not used for lighting control at fixed CONUS sites, since the trailer door is removed.

(3) *Lighting equipment control during emergency conditions.* When generator power is not available, two white incandescent lamps provide illumination for the trailer. These lamps, second and fifth incandescent light fixtures (4, fig. 27) from the trailer entrance, are powered by the trailer 24-volt battery system. THE CEILING LIGHTS switch on the trailer door light panel must be set to on to illuminate the lamps. No provisions are made for remote control operation of these lamps.

***Warning:* Damage to the eyes can result from looking directly at the blacklight lights for a prolonged period of time.**

(4) *Blacklight lighting equipment control.* There are six blacklight light fixtures (2, fig. 27), each of which contains a fluorescent lamp. The fluorescent lamps illuminate the fluorescent-painted panel engravings so they are easily visible when the white incandescent lamps are dimmed or extinguished. The blacklight light switch (1, fig. 50) on each blacklight light fixture must be depressed and held until the associated fluorescent lamp illuminates. If a fluorescent lamp is illuminated, and the MAIN POWER switch on the acquisition power control panel (1, fig. 25) is turned to off (down) position, the fluorescent lamp extinguishes. After the MAIN POWER switch is returned to ON, the blacklight switch on the particular blacklight light fixture must be depressed, released, and depressed again before the associated fluorescent lamp illuminates.

(5) *Early warning plotting board lights.* There are two early warning plotting board incandescent light fixtures (1, fig. 27), each of which contains one white incandescent lamp. The early warning plotting board light switch (3, fig. 50), when set to on, applies power to the early warning plotting

board incandescent lamps, causing them to illuminate the early warning plotting board (fig. 20). The early warning plotting board light knob (4, fig. 50), when turned counter-clockwise, reduces illumination of the early warning plotting board incandescent lamps, provided the early warning plotting board light switch is set to ON.

b. Lighting Equipment Control in the Trailer Mounted Tracking Station.

(1) *Lighting equipment control during normal conditions.*

(*a*) During normal conditions, the BLACKOUT OVERRIDE switch on the trailer door light panel is set to ON. This causes the white incandescent lamps in the eight normal and emergency, and normal and blackout incandescent light fixtures (2 and 3, fig. 35) to illuminate, provided the ENTRANCE LIGHT OVERRIDE SWITCH and the CEILING LIGHTS switch are set to ON. Each incandescent light fixture contains one white incandescent lamp except the second and fifth normal and emergency incandescent light fixtures (3, fig. 35) from the trailer mounted tracking station entrance. These two normal and emergency incandescent light fixtures each contain two white incandescent lamps.

(*b*) With the CEILING LIGHTS switch on the trailer door light panel set to ON, all white incandescent lamps in the eight normal and emergency, and normal and blackout incandescent light fixtures (2 and 3, fig. 35) illuminate at full brilliance. With the CEILING LIGHTS switch set to REMOTE, the brilliance of all but two white incandescent lamps is controlled by the CEILING LIGHTS switch and the CEILING LIGHTS knob on the electric light control (25, fig. 32) on the target radar control console. The two lamps that are not controlled remotely are located in the second and fifth normal and emergency incandescent light fixtures (3, fig. 35) from the trailer mounted tracking station entrance. These two white incandescent lamps do not illuminate during remote operation. When the CEILING LIGHTS switch on the electric light control is set to BRIGHT, all white incandescent lamps except the two explained above illuminate at full brilliance. When the CEILING LIGHTS switch on the electric light control is set to DIM, all white incandescent lamps except the two explained above may be adjusted to the desired brilliance by rotating the CEILING LIGHTS knob. The two white incandescent lamps not controlled remotely are for lighting during emergency conditions.

(*c*) The ENTRANCE LIGHT OVERRIDE SWITCH may be set to OFF, during normal conditions, to extinguish the white incandescent lamp in the first normal and blackout incandescent light fixture (2, fig. 35) from the trailer mounted tracking station entrance while the other white incandescent lamps are illuminated.

(2) *Lighting equipment control during blackout conditions.* During blackout conditions, the BLACKOUT OVERRIDE switch on the trailer door light panel is set to OFF, causing all white incandescent lamps in the six normal and blackout incandescent light fixtures (2, fig. 35) to extinguish and all blue incandescent lamps to illuminate. There is one blue incandescent lamp in each of the six normal and blackout incandescent light fixtures. The trailer door interlock switch (2, fig. 55) is not used for lighting control at fixed CONUS sites, since the trailer door is removed.

(3) *Lighting equipment control during emergency conditions.* Two white in-

candescent lamps provide illumination when generator power is not available. There is one white incandescent lamp each in the second and fifth normal and emergency incandescent light fixtures (3, fig. 35) from the trailer entrance. These white incandescent lamps are powered from the trailer 24-volt battery system. The CEILING LIGHTS switch on the trailer door light panel must be set to ON for the two white incandescent lamps to illuminate. There is no remote operation for these two white incandescent lamps.

***Warning:* Damage to the eyes can result from looking directly at the blacklight lights for a prolonged period of time.**

(4) *Blacklight lighting equipment control.* There are five blacklight light fixtures (1, fig. 35), each of which contains a fluorescent lamp. The fluorescent lamps illuminate the fluorescent-painted panel engravings so that they are easily visible when the white incandescent lamps are dimmed or extinguished. The blacklight light switch (1, fig. 55) on each blacklight light fixture must be depressed and held until the associate fluorescent lamp is illuminated. When a fluorescent lamp is illuminated, and the MAIN POWER switch on the radar power control-indicator (8, fig. 33) is turned to the off (down) position, the fluorescent lamp extinguishes. After the MAIN POWER switch is returned to ON, the blacklight light switch on the particular blacklight light fixture must be depressed, released, and depressed again before the fluorescent lamp illuminates.

Section VII (U). TACTICAL CONTROLS AND INDICATORS

136 (U). Equipment Status Control

a. General. Four equipment status indicator lights (4, fig. 22) are located on the upper right frame on the battery control console in the trailer mounted director station. Four equipment status indicator lights (3 through 6, fig. 32) are located on the center access door (2, fig. 32) of the target radar control console in the trailer mounted tracking station. These equipment status indicator lights are controlled by the equipment status switch (2, fig. 53) on the tactical control-indicator (11, fig. 22) on the battery control console. When any one is illuminated, the prevailing equipment status for the Improved NIKE-HERCULES System is indicated. The four equipment status indicator lights on each console, from left to right, are white, yellow, blue, and red, and indicate in the same order increasing degrees of equipment readiness. Only one color indicator light is illuminated at any given time. When the equipment status switch is moved from one position to another, a gong in the target radar control console sounds.

b. Equipment Status Switch.

(1) *WHITE position.* When the equipment status switch (2, fig. 53) on the tactical control-indicator is set to WHITE, the white equipment status indicator lights (4, fig. 22 and 3, fig. 32) illuminate. All other equipment status indicator lights extinguish.

Note. In the Improved NIKE-HERCULES System the yellow status indicator lights have no tactical significance.

(2) *YELLOW position.* When the equipment status switch is set to YELLOW, the yellow equipment status indicator lights (4, fig. 22 and 4, fig. 32) illuminate. For detailed information on the communication hot loops, refer to TM 9-1400-251-12.

(3) *BLUE position.* When the equipment status switch is set to BLUE, the blue equipment status indicator lights (4, fig. 22 and 5, fig. 32) illuminate. All other equipment status indicator lights extinguish.

(4) *RED position.* When the equipment status switch is set to RED, the red equipment status indicator lights (4, fig. 22 and 6, fig. 32) illuminate. The

multichannel data recorder (6, fig. 23) automatically begins operating provided the RECORD-VIEW switch is set to RECORD, and a target has been designated. All other equipment status indicator lights extinguish. Operation of the multichannel data recorder is discussed in paragraph 132.

137 (U). Mission and Missile Selection Control

a. Mission Selection. During normal operation, the setting of the MISSION switch on the battery signal panel-indicator (10, fig. 22) determines the type mission for a particular engagement.

(1) When the MISSION switch is set to SS, the Improved NIKE-HERCULES System is partially conditioned for the surface-to-surface mode of operation, and the MISSION—SS indicator light illuminates. The surface-to-surface mission is discussed in paragraph 150.

(2) When the MISSION switch is set to SA, the Improved NIKE-HERCULES System is automatically conditioned for the surface-to-air mode of operation, and the MISSION—SA indicator light illuminates. The surface-to-air mission is discussed in paragraph 149.

b. Missile Selection.

(1) Before selection of a fragmentation or cluster warhead missile for firing, it is necessary that terminal board TB1 (fig. 122) behind the upper right frame of the battery control console be checked for proper strapping. The strapping of this terminal board determines whether the Improved NIKE-HERCULES System is conditioned for firing a missile with a fragmentation warhead or a missile with a cluster warhead. Figure 122 shows terminals 5 and 6 of terminal board TB1 strapped for firing NIKE H FRAG type missiles (NIKE-HERCULES missiles with fragmentation warheads). This strapping is also used for NIKE-AJAX missiles, which are always equipped with fragmentation warheads. Terminals 4 and 5 (4 and 5, fig. 122) are strapped for firing NIKE H CLU type missiles (NIKE-HERCULES missiles with cluster warheads). The proper strapping for firing missiles with fragmentation warheads is shown on terminal board TB1.

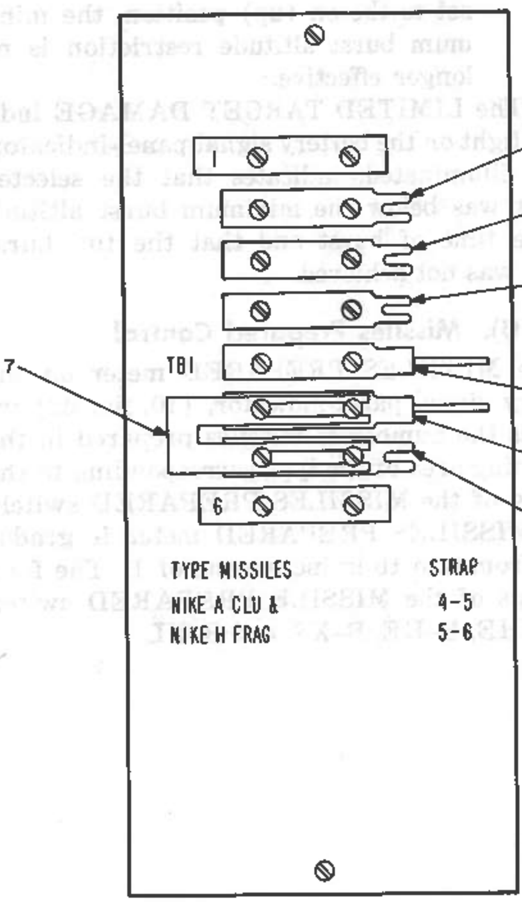
Note. When Improved NIKE-HERCULES Systems are shipped from the factory, terminal board TB1 is strapped for firing NIKE-AJAX missiles or NIKE-HERCULES missiles with fragmentation warheads.

(2) The MISSILE switch on the battery signal panel-indicator (10, fig. 22) is used to select the type of missile to be used by the Improved NIKE-HERCULES System for a particular engagement. Two banks of four indicator lights each are located above the MISSILE switch. An upper bank of four indicator lights is used with the FUIF equipment at a fixed CONUS site. When the indicator light corresponding to either I-HE, B-HE, B-XS, or B-XL illuminates, it indicates the type of missile designated for battery use by the Army Air Defense Command Post (AADCP). The lower bank of four indicator lights is controlled by the MISSILE switch.

(*a*) When the MISSILE switch is set to I-HE, the MISSILE—BTRY—I-HE indicator light illuminates, indicating that a NIKE-AJAX high explosive missile is designated for the current engagement.

(*b*) When the MISSILE switch is set to B-HE, the MISSILE—BTRY—B-HE indicator light illuminates, indicating that a NIKE-HERCULES high explosive missile is designated for the current engagement.

(*c*) When the MISSILE switch is set to B-XS, the MISSILE—BTRY—B-XS indicator light illuminates, indicating that a NIKE-HERCULES small nuclear warhead missile is designated for the current engagement. When the switch is set to this position, the MISSILE (left) side



1—Terminal 1
2—Terminal 2
3—Terminal 3
4—Terminal 4
5—Terminal 5
6—Terminal 6
7—Strap

Figure 122 (U). Terminal board TB1—strapping (U).

of the altitude plotting board glows red.

(*d*) When the MISSILE switch is set to B–XL, the MISSILE—BTRY—B–XL indicator light illuminates, indicating that a NIKE–HERCULES large nuclear warhead missile has been designated for the current engagement. When the switch is in this position, the MISSILE (left) side of the altitude plotting board glows red.

c. Launcher Data.

(1) When the LAUNCHER DATA switch on the battery signal panel-indicator (10, fig. 22) is depressed, the information determined by the setting of the MISSION switch and the MISSILE switch is released to the launching equipment, and the RELEASED indicator light illuminates, indicating that the launcher data has been released to the launching equipment. The LAUNCHER DATA—NOT RELEASED indicator light when illuminated, indicates that the selected missile and mission data has not been released to the launching equipment.

(2) The launcher data circuits do not release data for an incorrect selection of mission and missile. An incorrect selection of mission and missile occurs when the MISSION switch is set to either B–XS or B–XL, or when the MISSION switch is set to SS and the MISSILE switch is set to I–HE. If an incorrect selection of mission and missile combination occurs, the pertinent MISSION and MISSILE indicator lights extinguish, and the LAUNCHER DATA—NOT RELEASED indicator light remains illuminated when the LAUNCHER DATA switch is depressed.

(3) The selected mission and missile combination may be changed by the MISSION switch and the MISSILE switch and transmitted to the launching equipment by the LAUNCHER DATA switch any time before the fire order is issued. After the fire order is issued, a change in the mission and missile combination selected by the MISSION switch and the MISSILE switch does not affect the computer system until after the burst order has been issued, and cannot be released to the launching area by the LAUNCHER DATA switch until missile away has been detected.

138 (U). Minimum Burst Altitude Control

a. Minimum burst altitude control functions only when a nuclear warhead missile is selected. The purpose of this control is to assure that a

nuclear warhead missile does not descend below safe altitudes.

(1) The MIN BURST ALTITUDE knob on the battery signal panel-indicator (10, fig. 22) is used to assist in setting minimum burst altitude data into the computer system. The minimum burst altitude is indicated on the MIN BURST ALTITUDE 1000'S FEET dial. The dial is graduated from 0 to 10, representing 0 to 10,000 feet, in increments of 0.5, representing 500 feet. If the missile descends below the minimum burst altitude, a burst order is automatically issued by the computer system, provided the MBA OVERRIDE switch on the tactical control-indicator (11, fig. 22) is set to the off (down) position.

(2) When the MBA OVERRIDE switch is set to the on (up) position, the minimum burst altitude restriction is no longer effective.

b. The LIMITED TARGET DAMAGE indicator light on the battery signal panel-indicator, when illuminated, indicates that the selected target was below the minimum burst altitude at the time of burst and that the full burst effect was not achieved.

139 (U). Missiles Prepared Control

The MISSILES PREPARED meter on the battery signal panel-indicator, (10, fig. 22) indicates the number of missiles prepared in the launching area of the type corresponding to the setting of the MISSILES PREPARED switch. The MISSILES PREPARED meter is graduated from 0 to 16 in increments of 1. The four settings of the MISSILE PREPARED switch are I-HE, B-HE, B-XS, and B-XL.

CHAPTER 8 (C)

OPERATION OF THE RADAR COURSE DIRECTING CENTRAL

Section I (C). ENERGIZING THE EQUIPMENT

140 (U). General

a. This section gives the procedures for energizing the acquisition radar systems and computer system; the recording equipment, the TTR, TRR, and MTR systems; and the radar test set group. The energizing procedures for each system are given separately and should be performed in the step-by-step sequence given in paragraphs 141 through 147.

b. The equipment comprising the acquisition radar systems and computer system; and the TTR, TRR, and MTR systems may be partially or completely energized, depending on the tactical situation. When partially energized, the equipment is in the "low voltage" condition; when completely energized, it is in the "operate" condition. In the "low voltage" condition the equipment is not operative, but is in a state of readiness so that operation can begin in minimum time. The advantage of the "low voltage" condition is that it reduces deterioration of the equipment. In the "operate" condition, the equipment is completely energized and is ready for an actual engagement.

c. Operation of the acquisition radar systems and computer system; and the TTR, TRR, and MTR systems is related to the equipment cooling system described in paragraph 133. Before operation is begun, operating personnel should be familiar with the procedure for maintaining the operating temperature within safe limits.

d. The operator should notify organizational maintenance personnel if any abnormal condition is encountered during the energizing procedure.

e. Refer to TM 9-1430-253-12/3 for the procedures for energizing or deenergizing the HIPAR system. The procedures for controlling the HIPAR system from the trailer mounted director station are provided in tables 73 and 74.

f. Refer to the appropriate operator's manual for the procedures for energizing or deenergizing the AAR system.

141 (U). Energizing the Acquisition Radar Systems

a. Position of Controls Prior to Energizing. Prior to energizing the acquisition radar systems certain controls must be adjusted or set to designated positions. Prior positioning of controls is necessary to insure that application of power is controlled by the proper step-by-step energizing procedures to prevent damage to the equipment. Frequently, controls are already set to the desired position. Controls not given in the table may remain at their present setting, since they do not directly affect the energizing procedure. Repetition is used as a precautionary measure. Table 73 gives the position of controls prior to energizing acquisition radar systems to "operate".

b. Application of Power—"Shutdown" to "Operate". To place the acquisition radar systems in the "operate" condition, perform the steps in table 74 in the sequence given.

Table 73 (U). Position of Controls Prior to Energizing Acquisition Radar Systems to "Operate" (U)

Step	Location	Control	Control setting	Remarks
				Prerequisites: *a.* Check to see that 400-cycle engine-driven generator is operating. *b.* Check engine-driven generator to see that frequency is within specified limits and that magnitude of output voltage can be remotely controlled.

Table 73 (U). Position of Controls Prior to Energizing Acquisition Radar Systems to "Operate"—Continued *(U)*

Step	Location	Control	Control setting	Remarks
				Caution: **Damage to, or failure of, the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.** *Note.* Prior to normal operation, all cabinet doors in the trailer mounted director station and the trailer mounted tracking station should be secured to close all interlock switches. *Note.* Upon entering the trailer mounted director station set the BLACKOUT OVERRIDE switch to the on (up) position and set the CEILING LIGHTS switch to REMOTE.
1	Trailer mounted director station	EQUIPMENT COOLING INTAKE cover	Open	
		EQUIPMENT COOLING EXHAUST cover	Open	
2	Acquisition antenna pedestal	Antenna disable switch	ON	
3	Acquisition power control panel	EQPT VENT switch	On (up)	
4	Acquisition power control panel	BATTLE SHORT switch	Off (down) (protective cover must be down and safety wired)	
5	Acquisition power control panel	PRESENTATION POWER switch	Off (down)	
6	Acquisition power control panel	BARBETTE AC POWER switch	Off (down)	
7	Acquisition power control panel	BARBETTE DC switch	OFF	
8	Acquisition power control panel	VOLTS CHECK switch	OFF	
9	Acquisition power control panel	TRACK TRANSMITTER FILAMENTS switch	Off (down)	*Note.* During single engine alternator or motor alternator operation for Improved NIKE-HERCULES Systems, set VOLTS ADJ switch to OUT, and perform phase adjustments on radar power control-indicator in the trailer mounted tracking station, regardless of where neutral system is grounded. When this power system is used, perform steps 10, and 13 through 27 below. For Improved NIKE-HERCULES Systems that use two or more engine alternators or motor alternators, perform steps 11 through 27 below.
10	Acquisition power control panel	PHASE switch	C	LINE VOLTS meter should indicate 115 to 125 volts.
11	Acquisition power control panel	PHASE switch	C	LINE VOLTS meter should indicate 120 volts.

Table 73 (U). Position of Controls Prior to Energizing Acquisition Radar Systems to "Operate"—Continued *(U)*

Step	Location	Control	Control setting	Remarks
12	Acquisition power control panel	ADJUST PHASE C knob	Turn knob until LINE VOLTS meter indicates 120 volts.	
13	Acquisition power control panel	PHASE switch	A	LINE VOLTS meter should indicate 115 to 125 volts.
14	Acquisition power control panel	PHASE switch	B	LINE VOLTS meter should indicate 115 to 125 volts.
15	Acquisition power control panel	PHASE switch	C	Returns switch to proper setting so that the LINE VOLTS meter indicates a constant reference voltage for monitoring.
16	Acquisition power control panel	MAIN POWER switch	ON *Note.* This switch must be left in the ON position when the computer, TTR, TRR, or MTR systems are energized and are to remain energized.	*a.* Makes 3-phase power available to the LOPAR and computer systems. *b.* Supplies power to the recorder group (16, fig. 16), personnel heater (17, fig. 16), equipment cooling cabinet (20, fig. 16), trailer lighting equipment (fig. 27), and 110-volt ac outlets (10 and 21, fig. 16) in the trailer mounted director station. *c.* Supplies power to personnel heater, trailer lighting equipment, and 110-volt ac outlets in the trailer mounted tracking station. *d.* Supplies power to the 110-volt ac outlets on the missile track, target track, and target range antenna-receiver-transmitter groups. *e.* All ivory tactical control-indicator lights in the trailer mounted tracking station illuminate. *Note.* The condition of the HIPAR control-indicator and the HIPAR auxiliary control-indicator depends upon the HIPAR status.
17	Computer power control panel	COMPUTER POWER switch	Off (down) *Note.* This switch must be left in the ON position when the computer system is energized, and is to remain energized.	
18	LOPAR auxiliary control-indicator	HV SUPPLY knob	START position	
19	LOPAR auxiliary control-indicator	INDICATOR HV switch	Off (down)	
20	Tactical control-indicator	Plotting board condition switch	STAND BY	
21	Tactical control-indicator	PLOTTING LIGHTS HORIZONTAL knob	Maximum cw	Horizontal plotting board lights illuminate.
22	PPI	INTENSITY knob	Maximum ccw	
23	PPI	GAIN knob	Maximum ccw	

Table 73 (U). Position of Controls Prior to Energizing Acquisition Radar Systems to "Operate"—Continued *(U)*

Step	Location	Control	Control setting	Remarks
24	PPI	EXPANSION switch	OFF	
25	PPI	SYMBOLS switch	OFF	
26	PPI	SYMBOL INTENSITY knob	Maximum ccw	
27	PPI	RANGE switch	250,000	
28	Precision indicator	INTENSITY knob	Maximum ccw	
		GAIN knob	Maximum ccw	
29	LOPAR control-indicator	GAIN knob	Maximum ccw	
30	HIPAR control-indicator	GAIN knob	Maximum ccw	
31	Acquisition control-indicator	ACQUISITION RADAR switch	HIPAR LOPAR ONLY	On systems with HIPAR, set to HIPAR. On systems with AAR only, set to LOPAR ONLY.
			AAR	On systems with AAR and ECCM console, set to AAR.
32	AAR control-indicator	LOCAL—AAR CONT AUTO switch	LOCAL	On systems without ECCM console, set to LOCAL.
			AAR CONT AUTO	On systems with ECCM console, set to AAR CONT AUTO.

Table 74 (U). Application of Power—"Shutdown" to "Operate"—Acquisition Radar Systems (U)

Step	Location	Control	Control setting	Remarks
1	Acquisition power control panel	PRESENTATION POWER switch	ON	*a.* Applies ac power to presentation system in the director station trailer. Illuminates INTLK indicator light. *b.* Applies filament voltage to the battery control console and the power supplies of the director station group.
2	Acquisition power control panel	BARBETTE AC POWER switch	ON	*a.* Energizes 20–30 second delay timer. (1) Within 5 seconds, HIGH VOLTS—PREHEAT indicator light illuminates. (2) After 20 to 24 seconds have expired, PLATE VOLTS—READY indicator light illuminates. *b.* Energizes 5-minute delay timer. After 5-minute delay time has expired, HIGH VOLTS—HOT indicator light illuminates. *Note.* If desired, operating personnel may continue with steps 3 through 5 below without waiting for 5-minute time delay to expire.
3	Acquisition power control panel	PLATE VOLTS switch	On (up)	*a.* Applies plate voltage to presentation circuits and power circuits of the director station group. *b.* Illuminates PLATE VOLTS—ON indicator light.

Table 73 (U). Position of Controls Prior to Energizing Acquisition Radar Systems to "Operate"—Continued (U)

Step	Location	Control	Control setting	Remarks
12	Acquisition power control panel	ADJUST PHASE C knob	Turn knob until LINE VOLTS meter indicates 120 volts.	
13	Acquisition power control panel	PHASE switch	A	LINE VOLTS meter should indicate 115 to 125 volts.
14	Acquisition power control panel	PHASE switch	B	LINE VOLTS meter should indicate 115 to 125 volts.
15	Acquisition power control panel	PHASE switch	C	Returns switch to proper setting so that the LINE VOLTS meter indicates a constant reference voltage for monitoring.
16	Acquisition power control panel	MAIN POWER switch	ON *Note.* This switch must be left in the ON position when the computer, TTR, TRR, or MTR systems are energized and are to remain energized.	*a.* Makes 3-phase power available to the LOPAR and computer systems. *b.* Supplies power to the recorder group (16, fig. 16), personnel heater (17, fig. 16), equipment cooling cabinet (20, fig. 16), trailer lighting equipment (fig. 27), and 110-volt ac outlets (10 and 21, fig. 16) in the trailer mounted director station. *c.* Supplies power to personnel heater, trailer lighting equipment, and 110-volt ac outlets in the trailer mounted tracking station. *d.* Supplies power to the 110-volt ac outlets on the missile track, target track, and target range antenna-receiver-transmitter groups. *e.* All ivory tactical control-indicator lights in the trailer mounted tracking station illuminate. *Note.* The condition of the HIPAR control-indicator and the HIPAR auxiliary control-indicator depends upon the HIPAR status.
17	Computer power control panel	COMPUTER POWER switch	Off (down) *Note.* This switch must be left in the ON position when the computer system is energized, and is to remain energized.	
18	LOPAR auxiliary control-indicator	HV SUPPLY knob	START position	
19	LOPAR auxiliary control-indicator	INDICATOR HV switch	Off (down)	
20	Tactical control-indicator	Plotting board condition switch	STAND BY	
21	Tactical control-indicator	PLOTTING LIGHTS HORIZONTAL knob	Maximum cw	Horizontal plotting board lights illuminate.
22	PPI	INTENSITY knob	Maximum ccw	
23	PPI	GAIN knob	Maximum ccw	

Table 73 (U). Position of Controls Prior to Energizing Acquisition Radar Systems to "Operate"—Continued *(U)*

Step	Location	Control	Control setting	Remarks
24	PPI	EXPANSION switch	OFF	
25	PPI	SYMBOLS switch	OFF	
26	PPI	SYMBOL INTENSITY switch	Maximum ccw	
27	PPI	RANGE switch	250,000	
28	Precision indicator	INTENSITY knob	Maximum ccw	
		GAIN knob	Maximum ccw	
29	LOPAR control-indicator	GAIN knob	Maximum ccw	
30	HIPAR control-indicator	GAIN knob	Maximum ccw	

Table 74 (U). Application of Power—"Shutdown" to "Operate"—Acquisition Radar Systems (U)

Step	Location	Control	Control setting	Remarks
1	Acquisition power control panel	PRESENTATION POWER switch	ON	*a.* Applies ac power to presentation system in the director station trailer. Illuminates INTLK indicator light. *b.* Applies filament voltage to the battery control console and the power supplies of the director station group.
2	Acquisition power control panel	BARBETTE AC POWER switch	ON	*a.* Energizes 20–30 second delay timer. (1) Within 5 seconds, HIGH VOLTS—PREHEAT indicator light illuminates. (2) After 20 to 24 seconds have expired, PLATE VOLTS—READY indicator light illuminates. *b.* Energizes 5-minute delay timer. After 5-minute delay time has expired, HIGH VOLTS—HOT indicator light illuminates. *Note.* If desired, operating personnel may continue with steps 3 through 5 below without waiting for 5-minute time delay to expire.
3	Acquisition power control panel	PLATE VOLTS switch	On (up)	*a.* Applies plate voltage to presentation circuits and power circuits of the director station group. *b.* Illuminates PLATE VOLTS—ON indicator light. *c.* Extinguishes PLATE VOLTS—READY indicator light. *d.* Two 1550v fuse indicator lights are illuminated.
4	Acquisition power control panel	BARBETTE DC switch	ON	*a.* Applies DC voltage to the barbette of the LOPAR system, provided the interlocks and PLATE VOLTS switch are closed. *b.* Illuminates HIGH VOLTS—READY and BARBETTE DC indicator lights on acquisition power control panel and HV SUPPLY—READY indicator on the LOPAR auxiliary control-indicator, provided delay time as expired. *c.* Illuminates the AFC RELEASE light on the LOPAR control-indicator.

Table 74 (U). Application of Power—"Shutdown" to "Operate"—Acquisition Radar Systems—Continued *(U)*

Step	Location	Control	Control setting	Remarks
3 Cont.				*c.* Extinguishes PLATE VOLTS—READY indicator light. *d.* Two 1550v fuse indicator lights are illuminated.
4	Acquisition power control panel	BARBETTE DC switch	ON	*a.* Applies DC voltage to the barbette of the LOPAR system, provided the interlocks and PLATE VOLTS switch are closed. *b.* Illuminates HIGH VOLTS—READY and BARBETTE DC indicator lights on acquisition power control panel and HV SUPPLY—READY indicator on the LOPAR auxiliary control-indicator, provided delay time as expired. *c.* Illuminates the AFC RELEASE light on the LOPAR control-indicator.
5	Acquisition power control panel	TRACK TRANSMITTER FILAMENTS switch	On (up)	*Note.* Normally, this switch is operated only if a minimum warmup time is desired when energizing the radar systems from "shutdown" to "low voltage."
6	Acquisition power control panel	VOLTS CHECK switch	Turn switch in cw direction to each marked voltage position in succession. OFF	*a.* Permits selection of dc power supply voltages to be checked on VOLTS CHECK meter. *b.* At each switch position, pointer should rise to meter segment shown in listing below. *Switch position* — *Meter segment* −250 — ¾ −320 (center) — ¾ +150 — ¾ +220 (center) — ¾ +250 — ¾ +220A (center) — ¾ +320B (center) — ¾ +175 — ½ +270 — ½ −28 — ¼ +1550 — ¼ +150A — ¾ OFF — —
7	LOPAR control–indicator	ANT RPM switch	5 RPM	The LOPAR antenna rotates at a constant speed of 5 revolutions per minute.
8	LOPAR auxiliary control-indicator	INDICATOR HV switch	On (up)	Applies high voltage to the PPI. INDICATOR HV indicator light illuminates. *Note.* After HIGH VOLTS—HOT indicator light, HIGH VOLTS—READY indicator light on acquisition power control panel, and READY indicator on the LOPAR auxiliary control-indicator illuminate, the LOPAR system is in the "low voltage" condition.
9	LOPAR auxiliary control-indicator	HV SUPPLY—ON switch	Depress	*a.* Applies high voltage to the LOPAR transmitter system. *b.* On the acquisition power control panel, HIGH VOLTS—ON indicator light illuminates. The HIGH VOLTS—PREHEAT, HIGH VOLTS—HOT, HIGH VOLTS—READY, and INTLK indicator lights extinguish.

Table 74 (U). Application of Power—"Shutdown" to "Operate"—Acquisition Radar Systems—Continued *(U)*

Step	Location	Control	Control setting	Remarks
10	LOPAR auxiliary control-indicator	HV SUPPLY knob	Rotate knob smoothly cw until magnetron meter indicates 30 ma of current.	***Caution:* Do not force knob beyond the mechanical stops. If the meter needle continues to fluctuate after 5 to 10 seconds or the fluctuation is sufficient to actuate the overcurrent sensing device causing ON indicator to extinguish, turn the knob ccw as this is an indication of equipment malfunction.** Arcing within the magnetron may cause the meter indication to be unstable for the first few seconds of operation. The magnetron high voltage supply knob should be turned until 30 ma is indicated on the meter after indication has stabilized. On the LOPAR control-indicator, the LOPAR POWER indicator light illuminates.
11	LOPAR control-indicator	AJD—OFF switch	AJD (up)	
12	LOPAR control-indicator	I.S. or PROC. switch	Select either I.S. or PROC.	
13	LOPAR control-indicator	MAG FREQ switch		Operate to obtain desired transmitter frequency on the MAGNETRON FREQUENCY meter.
14	LOPAR control-indicator	ANT UP—DOWN/SCAN switch		Obtain the desired elevation of the LOPAR transmitter beam. *Note.* The LOPAR system is now energized through the "operate" condition. *Note.* To control the HIPAR system from the trailer mounted director station, the HIPAR system must be energized through "operate" as prescribed in TM 9-1430-254-12/5 or TM 9-1430-257-12/2. The TEST ENABLE switch-indicator illuminates (red), indicating that the HIPAR system is controlled from the power control-indicator. The HIPAR POWER indicator light on the HIPAR control-indicator illuminates.
15	HIPAR auxiliary control-indicator	TEST ENABLE switch-indicator	Depress	*a.* TEST ENABLE indicator illuminates (white) indicating that the HIPAR system is controlled from the HIPAR control-indicator and the HIPAR auxiliary control-indicator. *b.* Conditions of the remaining indicators on the HIPAR auxiliary control-indicator are as follows: (1) HIPAR READY, BATTLE SHORT, and DRIVE OVERLOAD RESET indicators illuminate (white). (2) HIPAR ON and HIPAR OPERATE indicators illuminate (green).
16	HIPAR control-indicator	CHANNEL 1 through CHANNEL 10 switch-indicators	Depress desired channel select switch-indicator	Selected CHANNEL indicator illuminates (green).
17	PPI	INTENSITY knob	Turn cw until radial sweep on the PPI is barely visible.	***Caution:* The cathode-ray tube used in the PPI employs a long persistence phosphor that burns very easily. The PPI should not be operated at high intensity level as the cathode-ray tube will be permanently damaged.**

Table 74 (U). Application of Power—"Shutdown" to "Operate"—Acquisition Radar Systems—Continued *(U)*

Step	Location	Control	Control setting	Remarks
5	Acquisition power control panel	TRACK TRANSMITTER FILAMENTS switch	On (up)	*Note.* Normally, this switch is operated only if a minimum warmup time is desired when energizing the radar systems from "shutdown" to "low voltage."
6	Acquisition power control panel	VOLTS CHECK switch	Turn switch in cw direction to each marked voltage position in succession. OFF	*a.* Permits selection of dc power supply voltages to be checked on VOLTS CHECK meter. *b.* At each switch position, pointer should rise to meter segment shown in listing below. *Switch position* — *Meter segment* −250 — ¾ −320 (center) — ¾ +150 — ¾ +220 (center) — ¾ +250 — ¾ +220A (center) — ¾ +320B (center) — ¾ +175 — ½ +270 — ½ −28 — ¼ +1550 — ¼ +150A — ¾ OFF — —
7	LOPAR control indicator	ANT RPM switch	5 RPM	The LOPAR antenna rotates at a constant speed of 5 RPM.
8	LOPAR auxiliary control-indicator	INDICATOR HV switch	On (up)	Applies high voltage to the PPI. INDICATOR HV indicator light illuminates. *Note.* After HIGH VOLTS—HOT indicator light, HIGH VOLTS—READY indicator light on acquisition power control panel, and READY indicator on the LOPAR auxiliary control-indicator illuminate, the LOPAR system is in the "low voltage" condition.
9	LOPAR auxiliary control-indicator	HV SUPPLY—ON switch	Depress	*a.* Applies high voltage to the LOPAR transmitter system. *b.* On the acquisition power control panel, HIGH VOLTS—ON indicator light illuminates. The HIGH VOLTS—PREHEAT, HIGH VOLTS—HOT, HIGH VOLTS—READY and INTLK indicator lights extinguish.
10	LOPAR auxiliary control-indicator	HV SUPPLY knob	Rotate knob smoothly cw until magnetron meter indicates 30 ma of current.	*Caution:* **Do not force knob beyond the mechanical stops. If the meter needle continues to fluctuate after 5 to 10 seconds or the fluctuation is sufficient to actuate the overcurrent sensing device causing ON indicator to extinguish, turn the knob ccw as this is an indication of equipment malfunction.** Arcing within the magnetron may cause the meter indication to be usable for the first few seconds of operation. The magnetron high voltage supply knob should be turned until 30 ma is indicated on the meter after indication has stabilized. On the LOPAR control-indicator, the LOPAR POWER indicator light illuminates.

Table 74 (U). Application of Power—"Shutdown" to "Operate"—Acquisition Radar Systems—Continued *(U)*

Step	Location	Control	Control setting	Remarks
11	LOPAR control-indicator	AJD—OFF switch	AJD (up)	
12	LOPAR control-indicator	I.S. or PROC. switch	Select either I.S. or PROC.	
13	LOPAR control-indicator	MAG FREQ switch		Operate to obtain desired transmitter frequency on the MAGNETRON FREQUENCY meter.
14	LOPAR control-indicator	ANT UP—DOWN/ SCAN switch		Obtain the desired elevation of the LOPAR transmitter beam. *Note.* The LOPAR system is now energized through the "operate" condition. *Note.* To control the HIPAR system from the trailer mounted director station, the HIPAR system must be energized through "operate" as prescribed in TM 9-1430-253-12/3. The TEST ENABLE indicator illuminates (red), indicating that the HIPAR system is controlled from the HIPAR building. HIPAR READY indicators on HIPAR and LOPAR control-indicators illuminate (amber).
15	HIPAR auxiliary control-indicator	TEST ENABLE switch-indicator	Depress	*a.* TEST ENABLE indicator illuminates (white) indicating that the HIPAR system is controlled from the HIPAR control-indicator and the HIPAR auxiliary control-indicator. *b.* Conditions of the remaining indicators on the HIPAR auxiliary control-indicator are as follows: (1) HIPAR READY, BATTLE SHORT, DRIVE OVERLOAD RESET, and CHANNEL 1 through CHANNEL 10 indicators illuminate (white). (2) HIPAR ON and HIPAR OPERATE indicators illuminate (green).
16	HIPAR auxiliary control-indicator	CHANNEL 1 through CHANNEL 10 switch-indicators	Depress desired channel select pushbutton.	Selected CHANNEL indicator illuminates (green).
17	HIPAR control-indicator	DISPLAY switch	NORMAL	
18	HIPAR control-indicator	RECEIVER switch	NORMAL	*Note.* The HIPAR system is now controlled from the trailer mounted director station.
	HIPAR control-indicator	CLUTTER GATE switch	OFF	
19	PPI	INTENSITY knob	Turn cw until radial sweep on the PPI is barely visible.	*Caution:* The cathode-ray tube used in the PPI employs a long persistence phosphor that burns very easily. The PPI should not be operated at high intensity level as the cathode-ray tube will be permanently damaged.
20	PPI	GAIN knob	Turn cw to obtain a clear presentation of acquisition reference marks on the PPI.	

Table 74 (U). Application of Power—"Shutdown" to "Operate"—Acquisition Radar Systems—Continued (U)

Step	Location	Control	Control setting	Remarks
18	PPI	GAIN knob	Turn cw to obtain a clear presentation of acquisition reference marks. on the PPI.	*Note.* The AAR must be energized through "operate" before performing steps 19 and 20 below.
19	AAR control-indicator	RADIATE OFF switch and RADIATE ON switch		Depress the RADIATE OFF switch, then the RADIATE ON switch.
20	AAR control-indicator	Mode switch S1	NORMAL RECEIVER	
21	LOPAR control-indicator	REC GAIN knob	Turn cw to obtain a clear presentation of acquisition video on the PPI.	
22	Precision indicator	INTENSITY knob	Turn cw until the sweep on the precision indicator is barely visible.	*Note.* If back sweep is visible on precision indicator, turn INTENSITY knob ccw until only a normal sweep appears.
23	Precision indicator	GAIN knob	Turn cw to obtain maximum clarity on the precision indicator.	
24	Tactical control-indicator	SIGNAL LIGHTS knob	Rotate until desired illumination of the indicator lights on battery control console is obtained.	

142 (C). Energizing the Computer System

a. Position of Controls Prior to Energizing. Prior to energizing the computer system, certain controls must be adjusted or set to designated positions. Prior positioning of controls is necessary to insure that application of power is controlled by the proper step-by-step energizing procedures to prevent damage to the equipment. Frequently, controls are already set to the desired position. Controls not given in the table may remain at their present setting since they do not directly affect the energizing procedure. Table 75 gives the position of controls prior to application of power.

b. Application of Power—"Shutdown" to "Computer Operate".

(1) The procedure for energizing the computer system from "shutdown" to "computer operate" is given in table 76. The computer system dc power voltage checks are made each time the computer system is energized. These checks are performed to insure that the outputs of the dc power supplies

are within specified limits. Adjustments to bring the outputs of the dc power supplies within limits require access to behind panel equipment and are normally performed by an organizational maintenance technician.

(2) The normal indication for each step performed during the energizing procedure is tabulated under the "Remarks" column in table 76.

Note. If any one of these indications is abnormal, notify an organizational maintenance technician.

(3) The 400-cycle ac power for the computer system is obtained from a 400-cycle engine-driven generator or from a motor alternator through the acquisition power control panel (1, fig. 25) of the director station group. Consequently, certain ac checks and adjustments must be made on the director station group prior to application of power to components of the computer system.

Table 75 (U). Position of Controls Prior to Energizing—Computer System (U)

Location	Control	Control setting
		Note. Prior to normal operation, all cabinet doors in the trailer mounted director station and the trailer mounted tracking station should be secured to close all interlock switches. *Note.* Upon entering the trailer mounted director station, set the BLACKOUT OVERRIDE switch to the on (up) position and set the CEILING LIGHTS switch to REMOTE.
Trailer mounted director station	EQUIPMENT COOLING INTAKE cover	Open
	EQUIPMENT COOLING EXHAUST cover	Open
Acquisition power control panel	EQPT VENT switch	On (up)
Acquisition power control panel	VOLTS ADJ switch	*Note.* The VOLTS ADJ switch is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one engine-driven generator is used, line voltage adjustments must be made by the ADJUST PHASE C knob on the radar power control-indicator, located in the trailer mounted tracking station. Line voltage adjustments may be made in either trailer provided the VOLTS ADJ switch is locked in the IN position and more than one engine-driven generator is used.
Acquisition power control panel	BATTLE SHORT switch	Off (down) (Protective cover must be down and safety wired.)
Acquisition power control panel	MAIN POWER switch	Off (down)
Acquisition power control panel	BARBETTE AC POWER switch	Off (down)
Acquisition power control panel	PRESENTATION POWER switch	Off (down)
Computer power control panel	COMPUTER POWER switch	Off (down)
Computer power control panel	PLATE VOLTS switch	Off (down)
Computer power control panel	SERVO DC switch	Off (down)
Computer power control panel	VOLTS CHECK switch	OFF

Table 74 (U). Application of Power—"Shutdown" to "Operate"—Acquisition Radar Systems—Continued *(U)*

Step	Location	Control	Control setting	Remarks
21	LOPAR control-indicator	REC GAIN knob	Turn cw to obtain a clear presentation of acquisition video on the PPI.	
22	Precision indicator	INTENSITY knob	Turn cw until the sweep on the precision indicator is barely visible.	*Note.* If back sweep is visible on precision indicator, turn INTENSITY knob ccw until only a normal sweep appears.
23	Precision indicator	GAIN knob	Turn cw to obtain maximum clarity on the precision indicator.	
24	Tactical control-indicator	SIGNAL LIGHTS knob	Rotate until desired illumination of the indicator lights on battery control console is obtained.	

142 (C). Energizing the Computer System

a. Position of Controls Prior to Energizing. Prior to energizing the computer system, certain controls must be adjusted or set to designated positions. Prior positioning of controls is necessary to insure that application of power is controlled by the proper step-by-step energizing procedures to prevent damage to the equipment. Frequently, controls are already set to the desired position. Controls not given in the table may remain at their present setting, since they do not directly affect the energizing procedure. Table 75 gives the position of controls prior to application of power.

b. Application of Power—"Shutdown" to "Computer Operate".

(1) The procedure for energizing the computer system from "shutdown" to "computer operate" is given in table 76. The computer system dc power voltage checks are made each time the computer system is energized. These checks are performed to insure that the outputs of the dc power supplies are within specified limits. Adjustments to bring the outputs of the dc power supplies within limits require access to behind panel equipment and are normally performed by an organizational maintenance technician.

(2) The normal indication for each step performed during the energizing procedure is tabulated under the "Remarks" column in table 76.

Note. If any one of these indications is abnormal, notify an organizational maintenance technician.

(3) The 400-cycle ac power for the computer system is obtained from a 400-cycle engine-driven generator or from a motor alternator through the acquisition power control panel (1, fig. 25) of the director station group. Consequently, certain ac checks and adjustments must be made on the director station group prior to application of power to components of the computer system.

Table 75 (U). Position of Controls Prior to Energizing—Computer System (U)

Location	Control	Control setting
		Note. Prior to normal operation all cabinet doors in the trailer mounted director station and the trailer mounted tracking station should be secured to close all interlock switches. *Note.* Upon entering the trailer mounted director station, set the BLACKOUT OVERRIDE switch to the on (up) position and set the CEILING LIGHTS switch to REMOTE.
Trailer mounted director station	EQUIPMENT COOLING INTAKE cover	Open
	EQUIPMENT COOLING EXHAUST cover	Open
Acquisition power control panel	EQPT VENT switch	On (up)
Acquisition power control panel	VOLTS ADJ switch	*Note.* The VOLTS ADJ switch is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one engine-driven generator is used, line voltage adjustments must be made by the ADJUST PHASE C knob on the radar power control-indicator, located in the trailer mounted tracking station. Line voltage adjustments may be made in either trailer provided the VOLTS ADJ switch is locked in the IN position and more than one engine-driven generator is used.
Acquisition power control panel	BATTLE SHORT switch	Off (down) (Protective cover must be down and safety wired.)
Acquisition power control panel	MAIN POWER switch	Off (down)
Acquisition power control panel	BARBETTE AC POWER switch	Off (down)
Acquisition power control panel	PRESENTATION POWER switch	Off (down)
Computer power control panel	COMPUTER POWER switch	OFF
Computer power control panel	PLATE VOLTS switch	Off (down)
Computer power control panel	SERVO DC switch	Off (down)
Computer power control panel	VOLTS CHECK switch	OFF
Computer control-panel	COMPUTER CONDITION switch	STAND BY
Computer control-panel	SERVO LIGHTS knob	Fully cw
Computer control-panel	LOCATION OF MISSILE RADAR FROM TARGET RADAR–YARDS —X dial	Loosen associated locknut and turn LOCATION OF MISSILE RADAR FROM TARGET RADAR–YARDS—X knob until dial indicates value shown on PARALLAX DATA RECORD plate. Tighten locknut.
Computer control-panel	LOCATION OF MISSILE RADAR FROM TARGET RADAR–YARDS —Y dial	Turn LOCATION OF MISSILE RADAR FROM TARGET RADAR–YARDS—Y knob until dial indicates value shown on PARALLAX DATA RECORD plate.
Computer control-panel	LOCATION OF MISSILE RADAR FROM TARGET RADAR–YARDS —H dial	Loosen associated locknut and turn LOCATION OF MISSILE RADAR FROM TARGET RADAR–YARDS—H knob until dial indicates value shown on PARALLAX DATA RECORD plate. Tighten locknut.

Table 75 (U). Position of Controls Prior to Energizing—Computer System—Continued *(U)*

Location	Control	Control setting
Computer control-panel	COMPUTER CONDITION switch	STAND BY
Computer control-panel	SERVO LIGHTS knob	Fully cw
Computer control-panel	LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS —X dial	Loosen associated locknut and turn LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS—X knob until dial indicates value shown on PARALLAX DATA RECORD plate. Tighten locknut.
Computer control-panel	LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS —Y dial	Turn LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS—Y knob until dial indicates value shown on PARALLAX DATA RECORD plate.
Computer control-panel	LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS —H dial	Loosen associated locknut and turn LOCATION OF MISSILE RADAR FROM TARGET RADAR-YARDS—H knob until dial indicates value shown on PARALLAX DATA RECORD plate. Tighten locknut.

Table 75 (U). Position of Controls Prior to Energizing—Computer System—Continued (U)

Location	Control	Control setting
Computer control-panel	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS —X dial	Loosen associated locknut and turn LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS—X knob until dial indicates value shown on PARALLAX DATA RECORD plate. Tighten locknut.
Computer control-panel	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS —Y dial	Turn LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS—Y knob until dial indicates value shown on PARALLAX DATA RECORD plate.
Computer control-panel	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS —H dial	Loosen associated locknut and turn LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS—H knob until dial indicates value shown on PARALLAX DATA RECORD plate. Tighten locknut.
Computer control-panel	LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS —R dial	Turn LOCATION OF LAUNCHER FROM TARGET RADAR-YARDS—R knob until dial indicates value shown on PARALLAX DATA RECORD plate.
Computer control-panel—(behind panel)	HT OF SITE dial	Obtain value to be set in from the BCO. Loosen associated locknut and turn HT OF SITE knob until dial indicates desired value. Tighten locknut.
Computer control-panel—(behind panel)	BURST TIME BIAS dial	Obtain value to be set in from the BCO. Loosen associated locknut and turn BURST TIME BIAS knob until dial indicates desired value. Tighten locknut.
Tactical control-indicator	Plotting board condition switch	STAND BY

Table 76 (U). Application of Power—"Shutdown" to "Computer Operate"—Computer System (U)

Step	Location	Control	Control setting	Remarks
	Trailer mounted director station			
				Prerequisites: *a.* Check that 400-cycle engine-driven generator is energized. *b.* Check engine-driven generator to see that frequency is within specified limits and that magnitude of output voltage can be remotely controlled. ***Caution:*** **Damage to, or failure of, the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.** ***Note.*** **During single engine alternator or motor alternator operation for Improved NIKE-HERCULES Systems, set VOLTS ADJ switch to OUT, and perform phase adjustments on radar power control-indicator in the trailer mounted tracking station, regardless of where neutral system is grounded. When this power system is used, perform steps 1, and 4 through 14 below. For Improved NIKE-HERCULES Systems that use two or more engine alternators or motor alternators, perform steps 2 through 14 below.**
	Director station group			
1	Acquisition power control panel	PHASE switch	C	LINE VOLTS meter should indicate 115 to 125 volts.

Table 76 (U). Application of Power—"Shutdown" to "Computer Operate"—Computer System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
2	Acquisition power control panel	PHASE switch	C	LINE VOLTS meter should indicate 120 volts.
3	Acquisition power control panel	ADJUST PHASE C knob	Turn until LINE VOLTS meter indicates 120 volts.	
4	Acquisition power control panel	PHASE switch	A	LINE VOLTS meter should indicate 115 to 125 volts.
5	Acquisition power control panel	PHASE switch	B	LINE VOLTS meter should indicate 115 to 125 volts.
6	Acquisition power control panel	PHASE switch	C	Returns switch to proper setting so that LINE VOLTS meter indicates a reference voltage for monitoring.
7	Acquisition power control panel	MAIN POWER switch	ON	*a.* Makes 3-phase power available to the acquisition radar and computer systems. *b.* Supplies power to the recorder group (16, fig. 16), personnel heater (17, fig. 16), equipment cooling cabinet (20, fig. 16), trailer lighting equipment (fig. 27), and 110-volt ac outlets (10 and 21, fig. 16) in the trailer mounted director station. *c.* Supplies power to personnel heater, trailer lighting equipment, and 110-volt ac outlets in the trailer mounted tracking station. *d.* Supplies power to the 110-volt ac outlets in the missile track, target track, and target range antenna-receiver-transmitter groups. *e.* All ivory tactical control-indicator lights in the trailer mounted tracking station illuminate.
8	Computer power control panel	COMPUTER POWER switch	ON	*a.* Applies ac power to computer system. *b.* The three COMPUTER POWER ON indicator lights illuminate. TEST indicator light on the computer control-panel and the COMPUTER TEST indicator on the tactical control-indicator (11, fig. 22) illuminate (red). *c.* Energizes 20–30 second delay timer. After the delay has expired, INTLK READY indicator light illuminates. *d.* The horizontal plotting board (21, fig. 22) altitude plotting board (8, fig. 22), battery control console light circuits, and dial light circuits of the servo computer assembly (fig. 18) are energized. The intensity of the lights can be adjusted by using the following controls: *Control* — *Lights* SERVO LIGHTS knob — Dial lights of servo computer assembly PLOTTING LIGHTS HORIZONTAL knob — Horizontal plotting boards PLOTTING LIGHTS ALTITUDE knob — Altitude plotting boards *Note.* Await illumination of INTLK READY indicator light before setting PLATE VOLTS switch to ON.

Table 76 (U). Application of Power—"Shutdown" to "Computer Operate"—Computer System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
9	Computer power control panel	PLATE VOLTS switch	ON	*a.* Applies dc plate voltage to components of the computer system. *b.* PLATE VOLTS indicator light illuminates, and INTLK READY indicator light extinguishes. *c.* Energizes computer standby interval timer located in upper compartment of computer power supply group. The timer cycles every 10 minutes. When PLATE VOLTS switch is first set to ON, ac voltage is applied to the zero-set switches and, depending on portion of cycle completed when PLATE VOLTS switch was last set to off (down) position, zero-set switches are energized within ½ to 4½ minutes. Thereafter, zero-set switches are energized ½ minute during each cycle. *d.* The 10 AMPLIFIER UNBALANCE indicator lights flicker for a short period. Thereafter, the indicator lights should extinguish. *e.* MISSILE SPEED meter on the tactical control-indicator (11, fig. 22) indicates approximately 1,400 knots.
10	Computer power control panel	SERVO DC switch	ON	*a.* SERVO DC indicator light illuminates. *b.* Applies +270 volts to circuits of computer system provided the computer standby interval timer is in energized cycle.
11	Computer control-panel	COMPUTER CONDITION switch	ACTION	ACTION indicator light illuminates, and TEST indicator light extinguishes. COMPUTER TEST indicator light on tactical control-indicator (11, fig. 22) extinguishes.
12	Computer power control panel	VOLTS CHECK switch	Turn switch in cw direction to each marked voltage position in succession.	*a.* Permits selection of dc power supply voltages to be checked on VOLTS CHECK meter. *b.* At each switch position, pointer should rise to the meter segment shown in listing below. *Note.* **If pointer falls outside the limits of a particular segment, an organizational maintenance technician must correct the malfunction causing the incorrect meter indication before the system can be operated. The meter pointer should be centered in the appropriate meter segment for those voltages designated by switch positions −320A, −320B, +320A, and +320B.** *Switch position* — *Meter segment* ADJUST— −320A (center) — ¾ ADJUST— +320A (center) — ¾ ADJUST— −320B (center) — ¾ ADJUST— +320B (center) — ¾ −320A — ¾ −320B — ¾ −250 — ¾ −200A — ¾ −200B — ¾ −28 — ¼ +75 — ½ +250 — ¾ +270 — ½ +320A — ¾ +320B — ¾ OFF — 0

Table 76 (U). Application of Power—"Shutdown" to "Computer Operate"—Computer System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
13	Computer power control panel	VOLTS CHECK switch	OFF	
14	Computer control-panel	COMPUTER CONDITION switch	ACTION	*a.* ACTION indicator light iluminates. *b.* TEST indicator light on the computer control-panel extinguishes, and COMPUTER TEST indicator on the tactical control-indicator (11, fig. 22) illuminates (white). *c.* The BALLISTICS EL, TIME TO INTERCEPT, and GYRO AZIMUTH dials indicate different values than they indicate in the "computer standby" condition due to the introduction of launcher-from-target-radar parallax. Indications depend on amount of parallax set in. *d.* Observe that plotting pens on horizontal plotting board and altitude plotting board assume positions listed in (1) through (4) below. *Note.* Steps (1) and (2) below may be performed only if plotting board condition switch is set to STANDBY. (1) The left recorder pen (2, fig. 22), of the horizontal plotting board comes to rest on the 4,800 mils azimuth line at approximately 1 inch inside the 200,000-yard range circle. (2) The right recorder pen (3, fig. 22), of the horizontal plotting board comes to rest on the 1,600 mils azimuth line at approximately 1 inch inside the 200,000-yard range circle. (3) The left recorder pen (9, fig. 22), on the altitude plotting board assumes a position on the 0 altitude line approximately 0.5 inch in from the left 200-second mark. (4) The right recorder pen (7, fig. 22), on the altitude plotting board assumes a position on the 0 altitude line approximately 0.5 inch in from the right 200-second mark. *e.* Check that AMPLIFIER UNBALANCE indicator lights extinguish shortly after COMPUTER CONDITION switch is set to ACTION. *Note.* The computer system is now energized to the "operate" condition.

143 (U). Energizing the Multichannel Data Recorder

a. General. The RECORD—VIEW switch and the OPERATE—TEST switch permit the multichannel data recorder (6, fig. 23) to record by three different methods: the signal-recording method, the alternate signal-recording method, and the test method. The signal-recording method is preferred during an engagement. When this method is used, the multichannel data recorder automatically begins recording when an engagement reaches the red alert status, provided the target has been designated. The alternate signal-recording method is used to energize the multichannel data recorder during an alert status other than red. The test method of energizing is provided to make calibration checks and adjustments of the recorder group. The multichannel data recorder is only partially energized in the test mode of operation.

b. Application of Power—Signal-Recording

Method. To energize the multichannel data recorder using the signal-recording method, perform the steps in table 77 in the sequence given.

c. Application of Power—Alternate Signal-Recording Method. To energize the multichannel data recorder using the alternate signal-recording method, perform the steps in table 78 in the sequence given.

d. Application of Power—Test Method. To energize the multichannel data recorder using the test method, perform the steps in table 79 in the sequence given.

Table 77 (U). Application of Power—Multichannel Data Recorder—Signal-Recording Method (U)

Step	Location	Control	Control setting	Remarks
				Prerequisites: *a.* Check that 400-cycle engine-driven generator is operating. *b.* Check engine-driven generator to make certain that frequency is within specified limits and that magnitude of output voltage can be remotely controlled. ***Caution:*** **Damage to, or failure of, the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.**
1	Meter and channel control-indicator	CALIBRATE—OPERATE—ZERO switch	OPERATE	
2	Acquisition power-control panel [1]	PHASE switch	C	LINE VOLTS meter should indicate 115 to 125 volts.
3	Acquisition power control panel [2]	PHASE switch	C	LINE VOLTS meter should indicate 120 volts.
4	Acquisition power control panel [3]	ADJUST PHASE C knob	Turn until LINE VOLTS meter indicates 120 volts.	
5	Acquisition power control panel	PHASE switch	A	LINE VOLTS meter should indicate 115 to 125 volts.
6	Acquisition power control panel	PHASE switch	B	LINE VOLTS meter should indicate 115 to 125 volts.
7	Acquisition power control panel	PHASE switch	C	Returns switch to proper setting so that the LINE VOLTS meter indicates a reference voltage for monitoring.
8	Acquisition power control panel	MAIN POWER switch	ON	*a.* Makes 3-phase power available to the multichannel data recorder. *b.* POWER—D.C. indicator light on the multichannel data recorder illuminates. *c.* POWER—400~ indicator light on the multichannel data recorder illuminates.
9	Multichannel data recorder	Shutter knob	Fully cw	Closes shutter.
10	Multichannel data recorder	RECORD—VIEW switch	RECORD	VIEW indicator light extinguishes, provided the OPERATE—TEST switch is set to TEST.

See footnotes at end of table.

Table 77 (U). Application of Power—Multichannel Data Recorder—Signal-Recording Method—Continued *(U)*

Step	Location	Control	Control setting	Remarks
11	Multichannel data recorder	Film footage counter		Check for adequate supply of recording paper. The END OF PAPER indicator light on the fuse and control panel (7, fig. 23) should be extinguished if more than 25 feet of recording paper is in the cylindrical supply drum.
12	Multichannel data recorder	OPERATE—TEST switch	OPERATE	*Note.* The recorder is now ready for operation. When a red alert status and a target designated signal are received, the recorder is automatically energized and operates until a lower alert status is established.

[1] Omit this step if two or more engine-driven generators are used.
[2] Omit this step if only one engine-driven generator is used.

Table 78 (U). Application of Power—Multichannel Data Recorder—Alternate Signal-Recording Method (U)

Step	Location	Control	Control setting	Remarks
				Prerequisites: *a.* Check that 400-cycle engine-driven generator is operating. *b.* Check engine-driven generator to make certain that frequency is within specified limits and that magnitude of output voltage can be remotely controlled. ***Caution:*** Damage to, or failure of, the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.
1	Meter and channel control-indicator	CALIBRATE—OPERATE—ZERO switch	OPERATE	
2	Acquisition power control panel [1]	PHASE switch	C	LINE VOLTS meter should indicate 115 to 125 volts.
3	Acquisition power control panel [2]	PHASE switch	C	LINE VOLTS meter should indicate 120 volts.
4	Acquisition power control panel [2]	ADJUST PHASE C knob	Turn until LINE VOLTS meter indicates 120 volts.	
5	Acquisition power control panel	PHASE switch	A	LINE VOLTS meter should indicate 115 to 125 volts.
6	Acquisition power control panel	PHASE switch	B	LINE VOLTS meter should indicate 115 to 125 volts.
7	Acquisition power control panel	PHASE switch	C	Returns switch to proper setting so that the LINE VOLTS meter indicates a reference voltage for monitoring.

See footnotes at end of table.

Table 78 (U). Application of Power—Multichannel Data Recorder—Alternate Signal-Recording Method—Continued *(U)*

Step	Location	Control	Control setting	Remarks
8	Acquisition power control panel	MAIN POWER switch	ON	*a.* Makes 3-phase power available to the multichannel data recorder. *b.* POWER—D.C. indicator light on the multichannel recorder illuminates. *c.* POWER—400~ indicator light on the multichannel data recorder illuminates.
9	Multichannel data recorder	Shutter knob	Fully cw	Closes shutter.
10	Multichannel data recorder	RECORD—VIEW switch	RECORD	VIEW indicator light extinguishes.
11	Multichannel data recorder	Film footage counter		Check for adequate supply of recording paper. The END OF PAPER indicator light on the fuse and control panel (7, fig. 23), should be extinguished if more than 25 feet of recording paper is in the cylindrical supply drum.
12	Multichannel data recorder	OPERATE—TEST switch	TEST	*a.* Applies necessary voltages to energize multichannel data recorder. *b.* Check that there are 16 red dots present on the direct trace monitoring screen. *c.* MOTOR ON indicator light illuminates. *d.* REC ON indicator light on the fuse and control panel illuminates. *e.* The RECORD NUMBER counter advances one number approximately 3 seconds after the OPERATE—TEST switch is set to TEST.

[1] Omit this step if two or more engine-driven generators are used.
[2] Omit this step if only one engine-driven generator is used.

Table 79 (U). Application of Power—Multichannel Data Recorder—Test Method (U)

Step	Location	Control	Control setting	Remarks
				Prerequisites: *a.* Check that 400-cycle engine-driven generator is operating. *b.* Check engine-driven generator to make certain that frequency is within specified limits and that magnitude of output voltage can be remotely controlled. *Caution:* Damage to, or failure of, the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.
1	Meter and channel control-indicator	CALIBRATE—OPERATE—ZERO switch	OPERATE	
2	Acquisition power control panel [1]	PHASE switch	C	LINE VOLTS meter should indicate 115 to 125 volts.
3	Acquisition power control panel [2]	PHASE switch	C	LINE VOLTS meter should indicate 120 volts.

See footnotes at end of table.

Table 79 (U). Application of Power—Multichannel Data Recorder—Test Method—Continued *(U)*

Step	Location	Control	Control setting	Remarks
4	Acquisition power control panel [2]	ADJUST PHASE C knob	Turn until LINE VOLTS meter indicates 120 volts.	
5	Acquisition power control panel	PHASE switch	A	LINE VOLTS meter should indicate 115 to 125 volts.
6	Acquisition power control panel	PHASE switch	B	LINE VOLTS meter should indicate 115 to 125 volts.
7	Acquisition power control panel	PHASE switch	C	Returns switch to proper setting so that the LINE VOLTS meter indicates a reference voltage for monitoring.
8	Acquisition power control panel	MAIN POWER switch	ON	*a.* Makes 3-phase power available to the multichannel data recorder. *b.* POWER—D.C. indicator light on the multichannel data recorder illuminates. *c.* POWER—400~ indicator light on the multichannel data recorder illuminates.
9	Multichannel data recorder	RECORD—VIEW switch	VIEW	Permits shutter to be opened.
10	Multichannel data recorder	Shutter knob	Fully ccw	Opens shutter.
11	Multichannel data recorder	OPERATE—TEST switch	TEST	*a.* VIEW indicator light illuminates. *b.* Partially energizes the multichannel data recorder by applying −28 volts to control circuits. *c.* The RECORD NUMBER counter advances one number approximately 3 seconds after OPERATE—TEST switch is set to TEST. *d.* Check that 16 red dots are present on the direct tracking monitoring screen. *e.* Observe galvanometer traces (white dots) on calibrated adjustment screen by looking through open shutter. *Note.* The multichannel data recorder is energized for testing. Calibration checks and adjustments can now be performed on the multichannel data recorder.

[1] Omit this step if two or more engine-driven generators are used.
[2] Omit this step if only one engine-driven generator is used.

144 (U). Energizing the Target Tracking Radar System

a. Position of Controls Prior to Energizing. Prior to energizing the TTR system, certain controls must be adjusted or set to designated positions. Prior positioning of controls is necessary to insure that application of power is controlled by the proper step-by-step energizing procedures to prevent damage to the equipment. Frequently, controls are already set to the desired position. Controls not given in the table may remain at their present setting since they do not directly affect the energizing procedure. Table 80 gives the position of controls prior to application of power.

b. Application of Power—"Shutdown" to "Operate". To place the TTR system in the "operate" condition, perform the steps in table 81 in the sequence given.

Table 80 (U). Position of Controls Prior to Energizing—Target Tracking Radar System (U)

Location	Control	Control setting
Acquisition power control panel [1]	VOLTS ADJ switch	*Note.* The VOLTS ADJ switch is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one generator is used, line voltage adjustments must be made by the ADJUST PHASE C knob on the radar power control-indicator, located in the trailer mounted tracking station. Line voltage adjustments may be made in either trailer provided the VOLTS ADJ switch is locked in the IN position and more than one engine-driven generator is used. *Note.* Upon entering the trailer mounted tracking station, set BLACKOUT OVERRIDE switch to on (up) position and set CEILING LIGHTS switch to REMOTE. *Note.* Prior to normal operation all cabinet doors in the trailer mounted tracking station and the trailer mounted director station should be secured to close all interlock switches.
Trailer mounted tracking station	EQUIPMENT COOLING INTAKE cover	Open
	EQUIPMENT COOLING EXHAUST cover	Open
Target track antenna-receiver-transmitter group	Slide (azimuth antirotational lock) (2, fig. 45)	Disengaged
Target track antenna-receiver-transmitter group	ELEVATION LOCK (5, fig. 45)	Disengaged
Target track antenna-receiver-transmitter group	BLOWER switch (5, fig. 44)	ON
Azimuth drive equipment enclosure	ANTENNA disable switch	NORMAL
Radar power control-indicator	EQPT VENT switch	On (up)
Radar power control-indicator	BATTLE SHORT switch	Off (down) (The protective cover must be down and safety wired.)
Radar power control-indicator	MAIN POWER switch	Off (down) *Note.* This switch must be left in the ON position if the MTR or TRR system is energized and is to remain energized.
Radar power control-indicator	MISSILE POWER switch	Off (down) *Note.* This switch must be left in the ON position if the MTR system is energized and is to remain energized.
Radar power control-indicator	TARGET POWER switch	Off (down)
Radar power control-indicator	TARGET—PLATE VOLTS switch	OFF
Radar power control-indicator	VOLTS CHECK—MISSILE switch	TARGET
Remote transmitter control	LOC-REM switch	REM
Electric light control	DIAL LIGHTS knob	Fully cw
Electric light control	SIGNAL LIGHTS knob	Fully cw

See footnote at end of table.

Table 80 (U). Position of Controls Prior to Energizing—Target Tracking Radar System—Continued *(U)*

Location	Control	Control setting
Electric light control	COORDINATE LOCK—ELEV switch	Off (down)
Electric light control	COORDINATE LOCK—AZ switch	Off (down)
Electric light control	COORDINATE LOCK—RANGE switch	Off (down)
Elevation indicator	INTENSITY knob	Fully ccw
Elevation indicator	SWEEP LENGTH knob	Fully ccw
Target track control-power supply	HV SUPPLY knob	START (fully ccw)
Target track control-power supply	IND HV switch	OFF
Target track control-power supply	AGC switch	AGC
Target track control-power supply	GAIN knob	Fully ccw
Target track control-power supply	IND switch	A
Target track control-power supply	PULSE switch	SHORT
Target track control-power supply	TTR PULSE WIDTH—ENABLE switch	Off (down)
Azimuth indicator	INTENSITY knob	Fully ccw
Azimuth indicator	SWEEP LENGTH knob	Fully ccw
B scope indicator	LIGHTS knob	Fully ccw
B scope indicator	INTENSITY knob	Fully ccw
B scope indicator	GAIN knob	Fully ccw
Range indicator	INTENSITY knob	Fully ccw
Range indicator	SWEEP LENGTH knob	Fully ccw
Target antenna control group	Azimuth MAN-AID-AUTO switch	MAN
Target antenna control group	SERVOS switch	NORMAL
Target antenna control group	TEST switch	Off (down)
Target antenna control group	Range MAN-ACQUIRE AID-TRACK AID-AUTO switch	MAN
Target antenna control group	RANGE switch	NORMAL
Target antenna control group	Elevation MAN-AID-AUTO switch	MAN
Target antenna control group	RANGE TRACK switch	TTR

[1] Omit this step for NIKE-HERCULES Systems 1096 and below.

Table 81 (U). Application of Power—"Shutdown" to "Operate"—Target Tracking Radar System (U)

Step	Location	Control	Control setting	Remarks
				Prerequisites: *a.* Check that 400-cycle engine-driven generator is operating. *b.* Check engine-driven generator to see that frequency is within specified limits and that magnitude of output voltage can be remotely controlled. ***Caution:*** **Damage to, or failure of, the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.**
1	Radar power control-indicator	PHASE switch	C	*Note.* During single engine alternator or motor alternator operation for Improved NIKE-HERCULES Systems, the phase adjustments for the trailer mounted director station and the trailer mounted tracking station are performed on the radar power control-indicator in the trailer mounted tracking station. Under these conditions, the VOLTS ADJ switch is set to OUT. For Improved NIKE-HERCULES Systems that use two or more engine alternators or motor alternators, the VOLTS ADJ switch is set to IN and the phase adjustments are performed in their respective trailers.
2	Radar power control-indicator	ADJUST PHASE C knob	Turn knob until LINE VOLTS meter indicates 120 volts.	
3	Radar power control-indicator	PHASE switch	A	LINE VOLTS meter should indicate 115 to 125 volts.
4	Radar power control-indicator	PHASE switch	B	LINE VOLTS meter should indicate 115 to 125 volts.
5	Radar power control-indicator	MAIN POWER switch	ON	*a.* Makes 3-phase power available to the TTR, TRR, and MTR systems. *b.* Energizes all blowers in the target track, target range, and missile track antenna-receiver-transmitter groups. *c.* Energizes radome inflation blower, provided the BLOWER switch (5, fig. 44) is set to ON. *d.* Energizes cooling equipment (4, fig. 26), provided EQPT VENT switch at the rear of radar power control-indicator is set to the on (up) position. *e.* Makes power available to radar test set (fig. 48). *f.* TARGET — INTLK, MISSILE — INTLK, and TRR—INTLK indicator lights illuminate.
6	Radar power control-indicator	TARGET POWER switch	ON	*a.* Applies filament voltage to TTR system. *b.* TARGET—HIGH VOLTS—PREHEAT indicator light illuminates. *c.* Energizes 20-30 second delay timer. After 20 to 24 seconds expires, TARGET—PLATE VOLTS—READY indicator light illuminates. *d.* Energizes 5-minute delay timer. After delay time has expired, TARGET—HIGH VOLTS—HOT indicator light illuminates. *e.* Dial lights on the elevation, azimuth, and target range indicators (26, 21, and 17, fig. 32) on the target radar control console illuminate. Target range dial (4, fig. 31) on the radar set group also illuminates. *Note.* When TARGET—PLATE VOLTS—READY indicator light illuminates, continue with steps 7, 8, and 9 below.

Table 81 (U). Application of Power—"Shutdown" to "Operate"—Target Tracking Radar System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
7	Radar power control-indicator	TARGET—PLATE VOLTS switch	On (up)	*a.* Applies plate voltage to TTR system. *b.* TARGET—PLATE VOLTS—ON indicator light illuminates. *c.* TARGET—PLATE VOLTS—READY indicator light extinguishes. *d.* TARGET — HIGH VOLTS — READY indicator light on the radar power control-indicator illuminates, and HV SUPPLY—READY indicator light on the target track control-power supply (22, fig. 32) illuminates, provided TARGET — HIGH VOLTS—HOT indicator light is already illuminated, indicating that the 5-minute delay time has expired. *e.* FREQUENCY meter on target track control-power supply (22, fig. 32) indicates relative frequency of the magnetron.
8	Radar power control-indicator	VOLTS CHECK—TARGET switch	Turn switch cw to each marked voltage position in succession.	*a.* Permits selection of dc voltage to be checked on VOLTS CHECK meter, provided VOLTS CHECK —MISSILE switch is set to TARGET. *b.* At each position of the switch, pointer should rise to the meter segment shown in the listing below. *Switch position* — *Meter segment* +220C — ½ +1550 — ¼ −250A — ¾ −320A (center) — ¾ +150A — ¾ +220A (center) — ¾ +250A — ¾ +320A (center) — ¾ +150C — ¾ +250C — ¾ +320C (center) — ¾ +450 (center) — ¾ +270 — ½ −28A — ¼ −28C — ¼ OFF — — *Note.* The +1550 switch position does not provide a proper meter indication until IND HV switch is set to on (up) and IND HV indicator light illuminates.
9	Radar power control-indicator	PHASE switch	C	
10	Radar power control-indicator	ADJUST PHASE C knob	Turn knob cw or ccw	LINE VOLTS meter should indicate 120 volts.
11	Radar power control-indicator	PHASE switch	A	LINE VOLTS meter should indicate 115 to 125 volts.
12	Radar power control-indicator	PHASE switch	B	LINE VOLTS meter should indicate 115 to 125 volts. *Note.* The TTR system is now in a "low voltage" condition.

Table 81 (U). Application of Power—"Shutdown" to "Operate"—Target Tracking Radar System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
13	Target track control-power supply	IND HV switch	On (up)	The IND HV indicator light illuminates. Applies high voltage to elevation, azimuth, target range, and B scope indicators and countermeasures control-indicator.
14	Target track control-power supply	HV SUPPLY —ON switch	Depress	*a.* Applies high voltage to transmitter system of the TTR system. *b.* The HV SUPPLY—ON indicator light illuminates, and the HV SUPPLY—READY indicator light extinguishes. *c.* The TARGET — HIGH VOLTS — ON indicator lights listed in (1) through (4) below extinguish. (1) TARGET—HIGH VOLTS—READY (2) TARGET—HIGH VOLTS—HOT (3) TARGET—HIGH VOLTS—PREHEAT (4) TARGET—INTLK
15	Target track control-power supply	HV SUPPLY knob	Turn knob cw until pointer of MAGNETRON meter is within the white segment of the meter.	***Caution:* Do not force knob beyond mechanical stops. If pointer fluctuation is sufficient to actuate the overcurrent sensing device causing HV SUPPLY—ON indicator light to extinguish, turn knob ccw to START and notify an organizational maintenance technician.** *Note.* To read the average magnetron current, the MAGNETRON switch must be in the center position (FS = 20MA). *Note.* LOPAR system must be energized to perform steps 16 through 18 below.
16	B scope indicator	GAIN knob	Turn cw for desired video display.	This control is used to obtain the best definition at maximum range on the B scope indicator.
17	B scope indicator	INTENSITY knob	Turn cw until sweep displays are barely visible.	***Caution:* The cathode-ray tube used in the B scope indicator employs a long-persistence phosphor that burns very easily. The B scope indicator should not be operated at a high intensity level as the cathode-ray tube will be permanently damaged.**
18	B scope indicator	LIGHTS knob	Turn cw to obtain desired brilliance of range and azimuth graticule.	
19	Elevation indicator	INTENSITY knob	Turn cw until elevation presentation is clearly visible.	
20	Elevation indicator	FOCUS knob	Turn cw or ccw to obtain a clearly defined elevation presentation.	
21	Azimuth indicator	INTENSITY knob	Turn cw until azimuth presentation is clearly visible.	

Table 81 (U). Application of Power—"Shutdown" to "Operate"—Target Tracking Radar System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
22	Azimuth indicator	FOCUS knob	Turn cw or ccw to obtain a clearly defined azimuth presentation.	
23	Target range indicator	INTENSITY knob	Turn cw until range presentation is clearly visible.	
24	Target range indicator	FOCUS knob	Turn cw or ccw to obtain a clearly defined range presentation.	*Note.* The TTR system is now in the "operate" condition.

145 (U). Energizing the Target Ranging Radar System

a. Position of Controls Prior to Energizing. Prior to energizing the TRR system certain controls must be adjusted or set to designated positions. Prior positioning of controls is necessary to insure that application of power is controlled by the proper step-by-step energizing procedures to prevent damage to the equipment. Frequently, controls are already set to the desired position. Controls not given in the table may remain at their present setting since they do not directly affect the energizing procedure. Table 82 gives the position of controls prior to application of power.

b. Application of Power—"Shutdown" to "Operate". To place the TRR system in the "operate" condition, perform the steps in table 83 in the sequence given.

Table 82 (U). Position of Controls Prior to Energizing—Target Ranging Radar System (U)

Location	Control	Control setting
Acquisition power control panel[1]	VOLTS ADJ switch	*Note.* The VOLTS ADJ switch is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one generator is used, line voltage adjustments must be made by the ADJUST PHASE C knob on the radar power control-indicator, located in the trailer mounted tracking station. Line voltage adjustments may be made in either trailer, provided the VOLTS ADJ switch is locked in the IN position and more than one engine-driven generator is used. *Note.* Upon entering the trailer mounted tracking station, set the BLACKOUT OVERRIDE switch to on (up) and set the CEILING LIGHTS switch to REMOTE. *Note.* Prior to normal operation all cabinet doors in the trailer mounted tracking station and the trailer mounted director station should be secured to close all interlock switches.
Trailer mounted tracking station	EQUIPMENT COOLING INTAKE cover	Open
	EQUIPMENT COOLING EXHAUST cover	Open

[1] Omit this step for NIKE-HERCULES Systems 1096 and below.

Table 82 (U). Position of Controls Prior to Energizing—Target Ranging Radar System—Continued *(U)*

Location	Control	Control setting
Target range antenna-receiver-transmitter group	Slide (azimuth anti-rotational lock) (2, fig. 45)	Disengage
Target range antenna-receiver-transmitter group	ELEVATION LOCK (5, fig. 45)	Disengage
Target range antenna-receiver-transmitter group	BLOWER switch (5, fig. 44)	ON
Azimuth drive equipment enclosure	ANTENNA disable switch	NORMAL
Radar power control-indicator	EQPT VENT switch	On (up)
Radar power control-indicator	MAIN POWER switch	Off (down)
		Note. This switch must be left in the ON position if the TTR system is energized and is to remain energized.
Range radar power control-indicator	TRR POWER switch	OFF
Range radar power control-indicator	PLATE VOLTAGE switch	OFF
Range radar power control-indicator	VOLTS CHECK switch	OFF
Range radar power control-indicator	TEST-OPERATE switch	OPERATE
Range radar power control-indicator	RADAR GAIN switch	AGC
Range radar power control-indicator	RADAR GAIN knob	Fully ccw
Range radar power control-indicator	MAG SEL switch	A or B
Range radar power control-indicator	FREQUENCY A–B switch	A or B
		Note. Settings of MAG SEL and FREQUENCY switches must correspond.
Range radar power control-indicator	LINE VOLTS SEL switch	φC
Range radar power control-indicator	ADJUST PHASE C knob	Fully ccw
Range radar power control-indicator	BATTLE SHORT switch	Off (down) (The protective cover must be down and safety wired.)
Range radar power control-indicator	INTLK OVERRIDE switch	Off (down)
Range radar power control-indicator	PULSE switch	LONG or SHORT
		Note. The TTR system is normally energized prior to energizing the TRR system. This procedure enables the operator to have controls used by both the TTR and TRR systems on the target radar control console (9, fig. 28) set to a desired position prior to energizing the TRR system.
Target antenna control group	RANGE TRACK switch	TRR
Countermeasures control-indicator	PAN FOCUS knob	Fully ccw
Countermeasures control-indicator	PAN INTENSITY knob	Fully ccw

Table 82 (U). Position of Controls Prior to Energizing —Target Ranging Radar System—Continued *(U)*

Location	Control	Control setting
Countermeasures control-indicator	TRR FOCUS knob	Fully ccw
Countermeasures control-indicator	TRR INTENSITY knob	Fully ccw
Countermeasures control-indicator	MAG SEL switch	A or B
Countermeasures control-indicator	MOD-A HV knob	Fully ccw
Countermeasures control-indicator	MOD-B HV knob	Fully ccw
Remote transmitter control	LOC-REM switch	REM

Table 83 (U). Application of Power—"Shutdown" to "Operate"—Target Ranging Radar System (U)

Step	Location	Control	Control setting	Remarks
				Prerequisites: *a.* Check that 400-cycle engine-driven generator is operating. *b.* Check engine-driven generator to see that frequency is within specified limits and that magnitude of output voltage can be remotely controlled. ***Caution:*** **Damage to or failure of the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance.** *Note.* During single engine alternator or motor alternator operation, the phase adjust power switch on the rear of the range radar power control-indicator must be strapped to the open position. Under this condition, perform steps 2 through 18 below. If voltage indication is abnormal, perform the phase adjustments as outlined in table 81. If normal indication cannot be obtained, notify an organizational maintenance technician. When two or more engine alternators or motor alternators are used, the phase adjust power switch must be strapped in the closed position. Under these conditions, perform steps 1, and 3 through 18 below.
1	Range radar power control-indicator	LINE VOLTS SEL switch	ϕC	LINE VOLTAGE meter should indicate 120 volts.
2	Range radar power control-indicator	LINE VOLTS SEL switch	ϕC	LINE VOLTAGE meter should indicate 115 to 125 volts.
3	Range radar power control-indicator	ADJUST PHASE C knob	Turn knob until LINE VOLTAGE meter indicates 120 volts.	
4	Range radar power control-indicator	LINE VOLTS SEL switch	ϕA	LINE VOLTAGE meter should indicate 115 to 125 volts.

Table 83 (U). Application of Power—"Shutdown" to "Operate"—Target Ranging Radar System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
5	Range radar power control-indicator	LINE VOLTS SEL switch	ϕB	LINE VOLTAGE meter should indicate 115 to 125 volts.
6	Range radar power control-indicator	LINE VOLTS SEL switch	ϕC	Returns switch to correct line voltage for monitoring.
7	Radar power control-indicator	MAIN POWER switch	ON	*Note.* Refer to table 81, step 5, for application of MAIN POWER switch.
8	Range radar power control-indicator	TRR POWER switch	ON	*a.* Applies filament voltage to TRR system. *b.* HIGH VOLTAGE—PREHEAT indicator light illuminates. *c.* Energizes 20–30 second delay timer. After 20 to 24 seconds expire, PLATE VOLTAGE—READY indicator light illuminates. *d.* Energizes 5-minute delay timer. After 5-minute delay time has expired, HIGH VOLTAGE—HOT indicator light illuminates. *Note.* When PLATE VOLTAGE—READY indicator light illuminates, continue with steps 9 and 10 below.
9	Range radar power control-indicator	PLATE VOLTS switch	On (up)	*a.* Applies plate voltage to TRR system. *b.* PLATE VOLTAGE—ON indicator light illuminates. *c.* PLATE VOLTAGE—READY and PLATE VOLTAGE—INTLK indicator lights extinguish. *d.* HIGH VOLTAGE—READY A and HIGH VOLTAGE—READY B indicator lights illuminate. MAG A—READY and MAG B—READY indicator lights on the countermeasures control-indicator illuminate, provided HIGH VOLTAGE—HOT indicator light is already illuminated, indicating the delay time of the 5-minute delay timer has expired. *e.* FREQUENCY meter indicates relative frequency of magnetrons A or B which are selected by FREQUENCY—A-B switch.
10	Range radar power control-indicator	VOLTS CHECK switch	Turn switch cw to each marked voltage position in succession.	*a.* Permits selection of the dc voltages to be checked on VOLTS CHECK meter. *b.* At each position of the switch, the meter pointer should rise to the meter segment shown in the listing below.

Switch position	*Meter segment*
−250	3/4
−320A (center)	3/4
+150	3/4
+250	3/4
+220 (center)	3/4
−320B (center)	3/4
+320 (center)	3/4
−28V	1/4
OFF	—

Note. The TRR system is now in "low voltage" condition.

Table 88 (U). Application of Power—"Shutdown" to "Operate"—Target Ranging Radar System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
11	Countermeasures control-indicator	MAG A—HV ON switch	Depress	*a.* Applies high voltage to magnetron A. *b.* The MAG A—READY indicator light extinguishes and the MAG A—HV ON indicator light illuminates. *c.* The HIGH VOLTAGE—ON A indicator light on the range radar power control-indicator illuminates and the indicator lights listed in (1) through (4) below extinguish. (1) HIGH VOLTAGE—PREHEAT (2) HIGH VOLTAGE—HOT (3) HIGH VOLTAGE—READY A
12	Countermeasures control-indicator	MOD A—HV knob	Turn knob cw until pointer of MAG A meter is within the white segment of the meter.	***Caution:*** **Do not force knob beyond mechanical stops. If pointer fluctuation is sufficient to actuate the overcurrent sensing device causing the MAG A—HV ON indicator light to extinguish, turn knob maximum ccw and notify an organizational maintenance technician.** *Note.* To read the average magnetron current, the MAG A switch must be in the center position.
13	Countermeasures control-indicator	MAG B—HV ON switch	Depress	*a.* Applies high voltage to magnetron B. *b.* The MAG B—READY indicator light extinguishes and the MAG B—HV ON indicator light illuminates. *c.* The HIGH VOLTAGE—ON B indicator light on the range radar power control-indicator illuminates and the HIGH VOLTAGE—READY B indicator light extinguishes.
14	Countermeasures control-indicator	MOD B—HV knob	Turn knob cw until pointer of MAG B meter is within the white segment of the meter.	***Caution:*** **Do not force knob beyond mechanical stops. If pointer fluctuation is sufficient to actuate the overcurrent sensing device causing the MAG B—HV ON indicator light to extinguish, turn knob maximum ccw and notify an organizational maintenance technician.**
15	Countermeasures control-indicator	PAN INTENSITY knob	Turn cw until panoramic sweep is visible.	
16	Countermeasures control-indicator	PAN FOCUS knob	Adjust until panoramic sweep is sharply defined.	
17	Countermeasures control-indicator	TRR INTENSITY knob	Turn cw until range sweep is visible.	
18	Countermeasures control-indicator	TRR FOCUS knob	Adjust until range sweep is sharply defined.	*Note.* The TRR system is now in "operate" condition.

146 (U). Energizing the Missile Tracking Radar System

a. Position of Controls Prior to Energizing. Prior to energizing the MTR system certain controls must be adjusted or set to designated positions. Prior positioning of controls is necessary to insure that application of power is controlled by the proper step-by-step energizing procedures to prevent damage to the equipment. Frequently, controls are already set to the desired position. Controls not given in the table may remain at their present setting since they do not directly affect the energizing procedure. Repetition is used as a precautionary measure. Table 84 gives the position of controls prior to application of power.

b. Application of Power—"Shutdown" to "Operate". To place the MTR system in the "operate" condition, perform the steps in table 85 in the sequence given.

Table 84 (U). Position of Controls Prior to Energizing—Missile Tracking Radar System (U)

Location	Control	Control setting
		Note. Upon entering the trailer mounted tracking station, set the BLACKOUT OVERRIDE switch to on (up) and set the CEILING LIGHTS switch to REMOTE. *Note.* Prior to normal operation all cabinet doors in the trailer mounted tracking station and the trailer mounted director station should be secured to close all interlock switches.
Acquisition power control panel [1]	VOLTS ADJ switch	*Note.* The VOLTS ADJ switch is locked in the OUT position during single engine-driven generator operation and in the IN position when two or more engine-driven generators are employed. When only one generator is used, line voltage adjustments must be made by the ADJUST PHASE C knob on the radar power control-indicator, located in the trailer mounted tracking station. Line voltage adjustments may be made in either trailer provided the VOLTS ADJ switch is locked in the IN position and more than one engine-driven generator is used.
Trailer mounted tracking station	EQUIPMENT COOLING INTAKE cover	Open
	EQUIPMENT COOLING EXHAUST cover	Open
Missile track antenna-receiver-transmitter group	Slide (azimuth antirotational lock) (2, fig. 45)	Disengaged
Missile track antenna-receiver-transmitter group	ELEVATION LOCK (5, fig. 45)	Disengaged
Missile track antenna-receiver-transmitter group	BLOWER switch (5, fig. 44)	ON
Azimuth drive equipment enclosure	ANTENNA disable switch	NORMAL
Radar power control-indicator	EQPT VENT switch	On (up)
Radar power control-indicator	BATTLE SHORT switch	Off (down) (The protective cover must be down and safety wired.)
Radar power control-indicator	MAIN POWER switch	Off (down) *Note.* This switch must be left in the ON position if the TTR or TRR system is energized and is to remain energized.
Radar power control-indicator	TARGET POWER switch	Off (down) *Note.* This switch must be left in the ON position if the TTR system is energized and is to remain energized.

[1] Omit this step for NIKE-HERCULES Systems 1096 and below.

Table 84 (U). Position of Controls Prior to Energizing—Missile Tracking Radar System—Continued *(U)*

Location	Control	Control setting
Radar power control-indicator	MISSILE POWER switch	Off (down)
Radar power control-indicator	MISSILE—PLATE VOLTS switch	OFF
Radar power control-indicator	VOLTS CHECK—MISSILE switch	TARGET
Radar power control-indicator	VOLTS CHECK—TARGET switch	OFF
Missile track control power supply	TUNE—SLEW	TUNE
Missile track control power supply	HV SUPPLY knob	START (fully ccw)
Missile track control power supply	IND HV switch	OFF
Missile track control power supply	AGC switch	AGC
Range indicator	IMAGE SPACING switch	OFF
Range indicator	INTENSITY knob	Fully ccw
Range indicator	SWEEP LENGTH knob	Fully ccw
Missile track control drawer	SERVOS switch	NORMAL
Missile track control drawer	RANGE switch	NORMAL
Missile track control drawer	DISABLE switch	Off (down)
Missile track control drawer	TEST switch	TEST
Missile track control drawer	Range MAN—AID—AUTO switch	MAN
Missile track control drawer	Azimuth MAN—AID—AUTO switch	MAN
Missile track control drawer	Elevation MAN—AID—AUTO switch	MAN
Missile control-indicator group	TARGET—STANDBY—MISSILE switch	STANDBY
Missile control-indicator group	SIGNAL LEVEL knob	Fully ccw
Missile control-indicator group	TEST switch	B or I
Missile track indicator	MISSILE READY switch	Off (down)
Missile track indicator	LOCAL DESIGNATE switch	Off (down)
Missile track indicator	DIAL LIGHTS knob	Fully cw
Missile track indicator	SIGNAL LIGHTS knob	Fully cw

Table 85 (U). Application of Power—"Shutdown" to "Operate"—Missile Tracking Radar System (U)

Step	Location	Control	Control setting	Remarks
				Prerequisites: *a.* Check that 400-cycle engine-driven generator is energized. *b.* Check that engine-driven generator frequency is within specified limits and that magnitude of output voltage can be remotely controlled. ***Caution:*** Damage to, or failure of, the equipment may result from energizing the equipment when the frequency or voltage is out of tolerance. *Note.* During single engine alternator or motor alternator operation for Improved NIKE-HERCULES Systems, the phase adjustments for the trailer mounted director station and the trailer mounted tracking station are performed on the radar power control-indicator in the trailer mounted tracking station. Under these conditions, the VOLTS ADJ switch is set to OUT. For Improved NIKE-HERCULES Systems that use two or more engine alternators or motor alternators, the VOLTS ADJ switch is set to IN and the phase adjustments are performed in their respective trailers.
1	Radar power control-indicator	PHASE switch	C	LINE VOLTS meter should indicate 120 volts.
2	Radar power control-indicator	ADJUST PHASE C knob	Turn knob until LINE VOLTS meter indicates 120 volts.	
3	Radar power control-indicator	PHASE switch	A	LINE VOLTS meter should indicate 115 to 125 volts.
4	Radar power control-indicator	PHASE switch	B	LINE VOLTS meter should indicate 115 to 125 volts.
5	Radar power control-indicator	MAIN POWER switch	ON	*a.* Makes 3-phase power available to the TTR and MTR systems. *b.* Energizes all blowers in the target track, target range, and missile track antenna-receiver-transmitter groups. *c.* Energizes radome inflation blower, provided the BLOWER switch (5, fig. 44), is set to ON. *d.* Energizes the cooling equipment (17, fig. 28), provided EQPT VENT switch at the rear of radar power control-indicator is set to on (up). *e.* Makes power available to radar test set (fig. 48). MISSILE—INTLK and TARGET—INTLK indicator lights illuminate.
6	Radar power control-indicator	MISSILE POWER switch	ON	*a.* Applies filament voltage to the MTR system. *b.* MISSILE—HIGH VOLTS—PREHEAT indicator light illuminates. *c.* Energizes 20–30 second delay timer. After 20 to 24 seconds have expired, MISSILE—PLATE VOLTS—READY indicator light illuminates. *d.* Energizes 5-minute delay timer. After delay time has expired, MISSILE—HIGH VOLTS—HOT indicator light illuminates.

Table 85 (U). Application of Power—"Shutdown" to "Operate"—Missile Tracking Radar System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
6				*e.* Dial lights at missile radar control console (fig. 30) illuminate. Missile range dial (7, fig. 31) illuminates. *Note.* After the MISSILE—PLATE VOLTS—READY indicator light illuminates, continue with steps 7, 8, and 9 below.
7	Radar power control-indicator	MISSILE—PLATE VOLTS switch	On (up)	*a.* Applies plate voltage to the MTR system. *b.* MISSILE—PLATE VOLTS—ON indicator light illuminates. *c.* MISSILE—PLATE VOLTS—READY indicator light extinguishes. *d.* MISSILE—HIGH VOLTS—READY indicator light on the radar power control-indicator and HV SUPPLY—READY indicator light on the missile track control power supply illuminate, provided MISSILE—HIGH VOLTS—HOT indicator light is already illuminated, indicating that the 5-minute time interval has expired. *e.* FREQUENCY meter indicates relative frequency of the magnetron.
8	Radar power control-indicator	VOLTS CHECK—MISSILE switch	Turn switch cw to each marked voltage position in succession.	*a.* Permits selection of dc voltages to be checked on VOLTS CHECK meter. *b.* At each position of the switch, meter pointer should rise to the meter segment shown in the listing below. *Switch position* — *Meter segment* TARGET −250B — ¾ −320B (center) — ¾ +150B — ¾ +220B (center) — ¾ +250B — ¾ +320B (center) — ¾ +150D — ¾ +250D — ¾ +320D (center) — ¾ +450 (center) — ¾ +270 — ½ −28B — ¼
9	Radar power control-indicator	VOLTS CHECK—MISSILE switch	TARGET	*Note.* The MTR system is now in "low voltage" condition.
10	Missile track control power supply	IND HV switch	On (up)	Applies high voltage to range indicator (10, fig. 30) and causes IND HV indicator light to illuminate.
11	Missile track control power supply	HV SUPPLY—ON switch	Depress	*a.* Applies high voltage to the transmitter system of the MTR system. *b.* HV SUPPLY—ON indicator light illuminates, and HV SUPPLY—READY indicator light extinguishes.

Table 85 (U). Application of Power—"Shutdown" to "Operate"—Missile Tracking Radar System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
11				*c.* MISSILE—HIGH VOLTS—ON indicator light on the radar power control-indicator illuminates, and the indicator lights listed in (1) through (4) below extinguish. (1) MISSILE—INTLK (2) MISSILE—HIGH VOLTS—PREHEAT (3) MISSILE—HIGH VOLTS—HOT (4) MISSILE—HIGH VOLTS—READY
12	Missile track control power supply	HV SUPPLY knob	Turn cw from START position until MAGNETRON meter indicates an average magnetron current of 8.5 ma for NIKE-HERCULES operation or 15 ma for NIKE-AJAX operation.	*Caution:* Do not force knob beyond mechanical stops. If pointer fluctuation is sufficient to actuate the overcurrent sensing device causing the HV SUPPLY—ON indicator light to extinguish, turn knob maximum ccw as this is an indication of equipment malfunction. *Note.* To read the average magnetron current, the MAGNETRON switch must be in the center position.
13	Missile track control power supply	TUNE-SLEW	SLEW	
14	Missile track control power supply	FREQUENCY	Operate to DECREASE or INCREASE	Selects the frequency of the tuned cavity in use on the FREQUENCY meter.
15	Missile track control power supply	TUNE-SLEW	TUNE	
16	Missile track control power supply	FREQUENCY	Operate to DECREASE or INCREASE	The pointer on the FREQUENCY meter is in the white section of the tune scale.
17	Range indicator	INTENSITY knob	Turn cw until range sweep is visible.	
18	Range indicator	FOCUS knob	Adjust until sweep is sharply defined.	
19	Missile track control drawer	TEST switch	Off (down)	*Note.* The MTR system is now in an "operate" condition, provided the computer is energized to the "operate" condition in accordance with table 76.

147 (U). Energizing the Radar Test Set Group

a. Energizing the Radar Test Set. All controls necessary for the remote operation of the radar test set (fig. 48) are on the missile control-indicator group (12, fig. 30) and the target test control (15, fig. 32). To apply primary power to the radar test set, both the MAIN POWER switch on the radar power control-indicator and the AC POWER switch on the test set monitor indicator panel must be set to ON. The AC POWER switch is normally left in the ON position so that application of primary power to the radar test set may be controlled with the MAIN POWER switch. To energize the radar test set from trailer mounted tracking station, the procedures given in *c* below should be followed. To energize the radar test set locally, the procedures given in *b* below should be followed.

b. Energizing Radar Test Set Locally. The radar test set has facilities for locally controlling the application of power. When the MAIN POWER switch and the AC POWER switch are set to ON, the radar test set is energized. The radar test set is normally energized locally for calibration checks and adjustments. These checks and adjustments are given in TM 9-1430-252-12/3.

Note. On the front of the radar test set, the AC POWER, TEST, and PWR METER CAL switches should be set and left in the ON, REMOTE, and MEAS positions, respectively.

c. Energizing Radar Test Set from the Trailer Mounted Tracking Station. To energize the radar test set from the trailer mounted tracking station, the procedures given in (1) and (2) below should be followed.

(1) *Energizing from the target radar control console.* To energize the radar test set from the target radar control console (9, fig. 28), set the controls to the positions listed in (*a*) through (*c*) below.

(*a*) Set MAIN POWER switch on the radar power control-indicator to ON.

(*b*) Set TEST switch on the target antenna control group (24, fig. 32) to TEST.

(*c*) Set TARGET—STANDBY—MISSILE switch on the missile control-indicator group (12, fig. 30) to TARGET, and check that RECEIVER TEST indicator light on the target test control (15, fig. 32) illuminates.

Note. The radar test set is now energized for operation with the TTR system.

(2) *Energizing from the missile radar control console.* To energize the radar test set from the missile radar control console (3, fig. 28), set the controls to the positions listed in (*a*) through (*c*) below.

(*a*) Set MAIN POWER switch on the radar power control-indicator to ON.

(*b*) Set TEST switch on the missile track control drawer (9, fig. 30) to TEST.

(*c*) Set TARGET—STANDBY—MISSILE switch on the missile control-indicator group (12, fig. 30) to MISSILE, and check that RECEIVER TEST indicator light illuminates.

Note. The radar test set is now energized for operation with the MTR system.

d. Energizing the RF Detector and Antenna Test Set. To energize the RF detector and antenna test set, follow the procedures listed in (1) through (4) below.

(1) Set MAIN POWER switch on the radar power control-indicator to ON.

(2) Set elevation and azimuth MAN—AID—AUTO switches on the target antenna control group (24, fig. 32) to MAN.

(3) Set CONTROL switch on the antenna test set to ANT.

(4) Set RF TEST SET switch on the antenna to ON.

Note. The RF detector and antenna test set are now energized for operation. Elevation and azimuth alinement procedures may be performed for parallax corrections of TTR and TRR.

Section II (C). OPERATION UNDER USUAL CONDITIONS

148 (C). General

a. Scope. This section describes the procedures for operating the radar course directing central (RCDC), a part of the Improved NIKE-HERCULES System, under usual conditions during surface-to-air and surface-to-surface missions. The operational sequence given in paragraphs 149 and 150 is not to be considered mandatory. These procedures are provided only to familiarize operating personnel with the operation of the RCDC. During an actual engagement or drill, the procedures given in the applicable SOP or in FM 44-82 should be followed.

b. Tactical Control. The tactical control of Improved NIKE-HERCULES Systems is normally a function of the Army Air Defense Command Post (AADCP). However, in an emergency the activities of an Improved NIKE-HERCULES System can be directed from the director station in the RCDC. The AADCP communicates with individual Improved NIKE-HERCULES Systems through the fire unit integration facility (par. 120) and the voice communications network. It normally supplies the following information to the RCDC.

(1) Early warning target position information
(2) Target identification
(3) Target designation
(4) Mission selection
(5) Missile and warhead selection

c. Missions. The Improved NIKE-HERCULES System is designed for two types of missions: surface-to-air (SA) and surface-to-surface (SS). Both types of missions can be used when firing NIKE-HERCULES missiles, but only the surface-to-air mission can be used when firing a NIKE-AJAX missile.

d. Missiles. Two types of missiles and several types of warheads can be used with the Improved NIKE-HERCULES System. The NIKE-HERCULES missile is available with high explosive (B-HE), small nuclear (B-XS), and large nuclear (B-XL) warheads. The NIKE-AJAX missile is available with the high explosive (I-HE) warhead only. The selection of the missile and warhead for an engagement is determined by the requirements of the tactical situation.

e. Indicator Lights. Indicator lights are provided in the Improved NIKE-HERCULES System to give operating personnel a visual indication of equipment status. In addition, the progress of an engagement from target designation to missile burst can be followed by observing the indicator lights on the battery control console, target radar control console, and missile radar control console.

f. Pre-operational Requirements. Before operation of the equipment, the required daily, weekly, and monthly operational checks must be performed as specified in TM 9-1430-255-12/1, TM 9-1430-251-12/1, and TM 9-1430-256-12/1. The equipment must be trouble free and energized to the "operate" condition as described in paragraphs 140 through 147. Operating personnel must be familiar with the controls, indicators, and indicator presentations described in chapters 5 and 6.

149 (C). Surface-to-Air Mission

a. Surface-to-Air Engagements. In normal surface-to-air engagements, the Improved NIKE-HERCULES Systems are integrated with the AADCP. The AADCP provides tactical control for the defense area and designates targets, missions, and missiles for individual Improved NIKE-HERCULES Systems. Usually, before potential targets are within range of the acquisition radar systems (LOPAR and HIPAR/AAR), the AADCP sends target position information to the designated Improved NIKE-HERCULES System. This information is plotted on the early warning plotting board, and the Improved NIKE-HERCULES System is prepared for the engagement. When the incoming targets are detected by the acquisition radar system, the AADCP designates the hostile aircraft to be engaged, and the acquisition radar acquires and tracks the designated target. The target is then designated to the TTR, and target position information obtained from the acquisition radar is transmitted to the TTR for use in acquiring the target. When the TTR has

acquired and tracked the target, continuous target position information is sent to the computer. Simultaneously, the type of mission and missile to be used in the engagement is designated by the AADCP, and the Improved NIKE-HERCULES System is conditioned for the mission and missile selected. After the missile type has been selected, a missile is designated. The designated missile is acquired and automatically tracked by the MTR, and continuous missile position information is sent to the computer. The computer continuously calculates the predicted point-of-intercept, using target position information, missile position information, and predetermined missile characteristics. When the predicted point-of-intercept falls within the intercept capabilities of the Improved NIKE-HERCULES System, the missile is launched. After initial orientation of the missile toward the predicted point-of-intercept, the missile is automatically guided to intercept the target by steering orders generated in the computer and transmitted by the MTR. When the missile arrives at a preset distance from the target, the computer issues a burst order that detonates the warhead in the missile. When missile burst occurs, the amount of target damage is determined and reported to the AADCP, and the Improved NIKE-HERCULES System is prepared for the next engagement. Procedures used in a surface-to-air engagement are given in *b* through *p* below.

b. Early Warning Procedures. When the early warning system detects unidentified targets approaching the defense area of an Improved NIKE-HERCULES System, the system is placed in blue alert status. In blue alert status, the early warning procedures listed in (1) through (5) below are followed.

(1) All operating personnel man their equipment and perform the blue alert status checks and adjustments specified in the SOP.

(2) The Army Air Defense Command Post (AADCP) sends continuous target position information by voice communications to the director station, where it is manually plotted on the early warning plotting board (5, fig. 18).

(3) The MISSILES PREPARED switch on the battery signal panel-indicator is set to I-HE, B-HE, B-XS, and B-XL to determine the number of missiles in each missile-warhead configuration that are available for the pending engagement. The number of missiles available in each configuration is indicated on the MISSILES PREPARED meter when the switch is set to each position.

(4) If the LOPAR or HIPAR/AAR acquisition radar systems are operating at this time, the acquisition PPI is monitored for the presence of targets, target data symbols from the AADCP, and countermeasures.

(5) If the pending engagement is to be controlled locally instead of by the AADCP, the LOCAL switch on the tactical control-indicator is depressed, causing the LOCAL indicator light on the tactical control-indicator to illuminate. In the local mode of operation, targets are identified and designated, and the mission and missile are selected at the director station.

c. Mission and Missile Selection. The mission has been previously determined as a surface-to-air (SA) type. However, several missile-warhead combinations can be used in an SA mission. The procedures for conditioning the Improved NIKE-HERCULES System for the selected mission and the procedures for selecting the appropriate missile-warhead combination are given in (1) through (4) below.

(1) The MISSION switch on the battery signal panel-indicator is set to SA. Operating the switch activates circuits for conditioning the radar course directing central (RCDC) for the selected mission and illuminates the MISSION—SA indicator light on the battery signal panel-indicator.

(2) The MISSILE—REM—I-HE indicator light, MISSILE—REM—B-HE indicator light, MISSILE—REM—B-XS indicator light, or the MISSILE—

Section II (C). OPERATION UNDER USUAL CONDITIONS

148 (C). General

a. Scope. This section describes the procedures for operating the radar course directing central (RCDC), a part of the Improved NIKE-HERCULES System, under usual conditions during surface-to-air and surface-to-surface missions. The operational sequence given in paragraphs 149 and 150 is not to be considered mandatory. These procedures are provided only to familiarize operating personnel with the operation of the RCDC. During an actual engagement or drill, the procedures given in the applicable SOP or in FM 44-82 should be followed.

b. Tactical Control. The tactical control of Improved NIKE-HERCULES Systems is normally a function of the Army Air Defense Command Post (AADCP). However, in an emergency the activities of an Improved NIKE-HERCULES System can be directed from the director station in the RCDC. The AADCP communicates with individual Improved NIKE-HERCULES Systems through the fire unit integration facility (par. 120) and the voice communications network. It normally supplies the following information to the RCDC.

(1) Early warning target position information

(2) Target identification

(3) Target designation

(4) Mission selection

(5) Missile and warhead selection

c. Missions. The Improved NIKE-HERCULES System is designed for two types of missions: surface-to-air (SA) and surface-to-surface (SS). Both types of missions can be used when firing NIKE-HERCULES missiles, but only the surface-to-air mission can be used when firing a NIKE-AJAX missile.

d. Missiles. Two types of missiles and several types of warheads can be used with the Improved NIKE-HERCULES System. The NIKE-HERCULES missile is available with high explosive (B-HE), small nuclear (B-XS), and large nuclear (B-XL) warheads. The NIKE-AJAX missile is available with the high explosive (I-HE) warhead only. The selection of the missile and warhead for an engagement is determined by the requirements of the tactical situation.

e. Indicator Lights. Indicator lights are provided in the Improved NIKE-HERCULES System to give operating personnel a visual indication of equipment status. In addition, the progress of an engagement from target designation to missile burst can be followed by observing the indicator lights on the battery control console, target radar control console, and missile radar control console.

f. Pre-operational Requirements. Before operation of the equipment, the required daily, weekly, and monthly operational checks must be performed as specified in TM 9-1430-250-12/2, TM 9-1430-250-12/4, TM 9-1430-251-12, and TM 9-1430-252-12/3. The equipment must be trouble free and energized to the "operate" condition as described in paragraphs 140 through 147. Operating personnel must be familiar with the controls, indicators, and indicator presentations described in chapters 5 and 6.

149 (C). Surface-to-Air Mission

a. Surface-to-Air Engagements. In normal surface-to-air engagements, the Improved NIKE-HERCULES Systems are integrated with the AADCP. The AADCP provides tactical control for the defense area and designates targets, missions, and missiles for individual Improved NIKE-HERCULES Systems. Usually, before potential targets are within range of the acquisition radar systems (LOPAR and HIPAR/AAR), the AADCP sends target position information to the designated Improved NIKE-HERCULES System. This information is plotted on the early warning plotting board, and the Improved NIKE-HERCULES System is prepared for the engagement. When the incoming targets are detected by the acquisition radar system, the AADCP designates the hostile aircraft to be engaged, and the acquisition radar acquires and tracks the designated target. The target is then designated to the TTR, and target position information obtained from the acquisition radar is transmitted to the TTR for use in acquiring the target. When the TTR has

acquired and tracked the target, continuous target position information is sent to the computer. Simultaneously, the type of mission and missile to be used in the engagement is designated by the AADCP, and the Improved NIKE-HERCULES System is conditioned for the mission and missile selected. After the missile type has been selected, a missile is designated. The designated missile is acquired and automatically tracked by the MTR, and continuous missile position information is sent to the computer. The computer continuously calculates the predicted point-of-intercept, using target position information, missile position information, and predetermined missile characteristics. When the predicted point-of-intercept falls within the intercept capabilities of the Improved NIKE-HERCULES System, the missile is launched. After initial orientation of the missile toward the predicted point-of-intercept, the missile is automatically guided to intercept the target by steering orders generated in the computer and transmitted by the MTR. When the missile arrives at a preset distance from the target, the computer issues a burst order that detonates the warhead in the missile. When missile burst occurs, the amount of target damage is determined and reported to the AADCP, and the Improved NIKE-HERCULES System is prepared for the next engagement. Procedures used in a surface-to-air engagement are given in *b* through *p* below.

b. Early Warning Procedures. When the early warning system detects unidentified targets approaching the defense area of an Improved NIKE-HERCULES System, the system is placed in blue alert status. In blue alert status, the early warning procedures listed in (1) through (5) below are followed.

(1) All operating personnel man their equipment and perform the blue alert status checks and adjustments specified in the SOP.

(2) The Army Air Defense Command Post (AADCP) sends continuous target position information by voice communications to the director station, where it is manually plotted on the early warning plotting board (5, fig. 18).

(3) The MISSILES PREPARED switch on the battery signal panel-indicator is set to I-HE, B-HE, B-XS, and B-XL to determine the number of missiles in each missile-warhead configuration that are available for the pending engagement. The number of missiles available in each configuration is indicated on the MISSILES PREPARED meter when the switch is set to each position.

(4) If the LOPAR or HIPAR/AAR acquisition radar systems are operating at this time, the acquisition PPI is monitored for the presence of targets, fire unit integration facility (FUIF) symbols, and countermeasures.

(5) If the pending engagement is to be controlled locally instead of by the AADCP, the LOCAL switch on the tactical control-indicator is depressed, causing the LOCAL indicator light on the tactical control-indicator to illuminate. In the local mode of operation, targets are identified and designated, and the mission and missile are selected at the director station.

c. Mission and Missile Selection. The mission has been previously determined as a surface-to-air (SA) type. However, several missile-warhead combinations can be used in an SA mission. The procedures for conditioning the Improved NIKE-HERCULES System for the selected mission and the procedures for selecting the appropriate missile-warhead combination are given in (1) through (4) below.

(1) The MISSION switch on the battery signal panel-indicator is set to SA. Operating the switch activates circuits for conditioning the radar course directing central (RCDC) for the selected mission and illuminates the MISSION—SA indicator light on the battery signal panel-indicator.

(2) When the Improved NIKE-HERCULES System is integrated with the MISSILE MONITOR (AN/MSG-4), the MISSILE—REM—I-HE indicator light, MISSILE—REM—B-HE indicator light, MISSILE—REM—B-XS indicator light, or the MISSILE—

REM—B-XL indicator light on the battery signal panel-indicator will illuminate to indicate the type of missile-warhead combination to use for the pending engagement. The REMOTE indicator light on the tactical control-indicator also illuminates to indicate that a command has been issued by the AADCP. When the illuminated indicator light is observed, the ACKNOW switch on the tactical control-indicator is depressed. Depressing the switch sends an acknowledgment signal to the AADCP and extinguishes the REMOTE indicator light. After acknowledging the signal from the AADCP, the MISSILE switch is set to the position corresponding to the illuminated indicator light. Setting the switch initiates the following events.

(*a*) A signal is sent to the missile tracking radar (MTR) system to condition the MTR for the type of missile selected. The MISSILE—NIKE I indicator light or the MISSILE—NIKE B indicator light on the missile control-indicator group is illuminated to indicate whether a NIKE-AJAX or NIKE-HERCULES missile has been selected for the engagement.

(*b*) A signal is sent to the computer to condition it for the type of missile and warhead selected.

Note. Each time a signal is sent by the AADCP through the FUIF system, the REMOTE indicator light is illuminated and remains illuminated until the ACKNOW switch is depressed.

(3) If the engagement is to be locally controlled, the MISSILE switch on the battery signal panel-indicator is set to I-HE, B-HE, B-XS, or B-XL in accordance with instructions from the AADCP or the SOP. The corresponding MISSILE—BTRY—I-HE indicator light, MISSILE—BTRY—B-HE indicator light, MISSILE—BTRY—B-XS indicator light, or MISSILE—BTRY—B-XL indicator light on the battery signal panel-indicator is illuminated. A signal is also sent to the computer to condition it for the type of missile and warhead selected.

(4) If a nuclear warhead has been selected in (2) or (3) above, red lights illuminate the altitude plotting board (8, fig. 22). The MIN. BURST ALTITUDE 1000'S FEET knob on the battery signal panel-indicator is adjusted until the MIN. BURST ALTITUDE 1000'S FEET dial indicates the minimum burst altitude (MBA) specified in the SOP. Operating the knob conditions circuits in the computer to prevent the missile from bursting below a safer altitude.

Note. If necessary, the minimum burst altitude circuits in the computer can be overridden by operating the MBA OVERRIDE switch on the tactical control-indicator to the override position (up).

d. Equipment Conditioning. After the selection of the mission and missile, the procedures given in (1) through (4) below are followed to prepare the computer, MTR, and launching area for action.

(1) The COMPUTER CONDITION switch on the computer control-panel is set to ACTION. When the switch is in this position, preset stored data on the selected mission, missile, and warhead is released for use by the computer in solving the intercept problem. The TEST indicator light on the computer control-panel extinguishes and the ACTION indicator light illuminates.

(2) The LAUNCHER DATA switch on the battery signal panel-indicator is depressed. When the switch is depressed, mission and missile data is transmitted to the launching area. This data is used by launching area personnel in selecting the launching section, launcher, and missile for the engagement. The LAUNCHER DATA—NOT RELEASED indicator light on the battery signal panel-indicator extinguishes and the LAUNCHER DATA—RELEASED indicator light illuminates.

374-654 O - 70 - 28

(3) The TEST-NORMAL switch on the missile control-indicator group is set to NORMAL. Setting the switch to this position removes the missile tracking radar system from test mode and allows the system to be conditioned for an engagement.

(4) A verbal command is transmitted to the launching area for the elevation of underground launchers. On receiving this command, launching area personnel elevate all launchers.

e. Red Alert. When attack against the defended area of an Improved NIKE-HERCULES System becomes imminent, the system is placed in red alert status and the procedures given in (1) through (4) below are followed.

(1) The equipment status switch on the tactical control-indicator is set to RED, initiating the following actions.

(*a*) The blue equipment status indicator light on the battery control console extinguishes and the red equipment status indicator light illuminates.

(*b*) A gong sounds on the target radar control console to notify tracking station personnel that a change in alert status has occurred.

(*c*) The blue equipment status indicator light on the target radar control console extinguishes and the red equipment status indicator light illuminates.

(*d*) The multichannel data recorder in the recorder group is energized and the recording of tactical and equipment data is begun provided a target has been designated.

(*e*) A red alert signal is sent to the launching area.

(2) A launcher and launching section are selected by launching area personnel, and a signal corresponding to the selected launcher and launching section is sent to the MTR. This signal causes the SECTION—A indicator light, SECTION—B indicator light, SECTION—C indicator light, or SECTION—D indicator light on the missile track indicator to illuminate. It also causes the LAUNCHER—1 indicator light, LAUNCHER—2 indicator light, LAUNCHER—3 indicator light, or LAUNCHER—4 indicator light on the missile track indicator to illuminate.

(3) When both the launcher and launching section have been selected, the MTR automatically slews to the designated missile. The ivory MISSILE—DESIGNATED indicator light on the battery signal panel-indicator extinguishes and the green MISSILE—DESIGNATED indicator light illuminates. The ivory DESIGNATE indicator light on the missile control-indicator group extinguishes and the green DESIGNATE indicator light illuminates.

Note. In an emergency the launcher, launching section, and missile can be designated at the missile track indicator (11, fig. 30) by following the procedures given in paragraph 163.

(4) A missile ready signal is sent to the RCDC by the launching area. The ivory MISSILE—READY indicator light on the battery signal panel-indicator extinguishes and the green MISSILE—READY indicator light illuminates. The ivory READY indicator light on the missile control-indicator group extinguishes and the green READY indicator light illuminates. Illumination of the green indicator light indicates that the designated missile is ready for acquisition by the MTR.

f. Acquisition Radar Selection. Two acquisition radar systems, LOPAR and HIPAR, are available for use with the Improved NIKE-HERCULES System. The same presentation system (PPI scope and precision indicator) and target acquisition controls are used for both radar systems. The choice of acquisition radar systems for a given engagement is determined by the tactical situation. The radar system is selected by setting the RADAR SELECT switch on the IFF control-indicator to LOPAR or HIPAR. Operation of the switch connects the

selected radar to the acquisition presentation system. It also causes the LOPAR SELECTED indicator light on the LOPAR control-indicator or the HIPAR/AAR SELECTED indicator light on the HIPAR control-indicator to illuminate.

g. Target Interrogation and Identification. Targets can be identified by the AADCP or interrogated locally by the Improved NIKE-HERCULES System. Normally, the targets are identified by the AADCP and the target identity is transmitted to the individual Improved NIKE-HERCULES Systems through the FUIF system (par. 120). Locally, targets are identified by the selected identification feature/identification friend or foe (SIF/IFF) system (par. 121). The procedure for identifying targets with the SIF/IFF system is given in (1) through (3) below.

(1) The CHALLENGE switch on the IFF control-indicator is depressed. When the switch is depressed, a coded interrogation signal is transmitted to the target through the acquisition radar antenna and the CHALLENGE ON indicator light on the IFF control-indicator illuminates.

(2) If the target is friendly, a similarly coded signal will be transmitted by the target to the interrogating SIF/IFF system, and a return signal will automatically appear on the acquisition PPI near the target video.

(3) If the target is a foe, an SIF/IFF return signal will not appear on the acquisition PPI and the FOE switch on the IFF control-indicator is depressed. Depressing the switch causes the ivory TARGET—FOE indicator light on the battery signal panel-indicator to extinguish and the green TARGET—FOE indicator light to illuminate. A signal is also sent to the AADCP to indicate that the target has been identified as hostile.

h. Target Acquisition. In normal operation, the AADCP designates the target for a given Improved NIKE-HERCULES System by "painting" a FUIF foe symbol around the designated target video appearing on the acquisition PPI. When this symbol appears, the FOE switch is depressed and acquisition of the target is begun. The procedures for acquiring and tracking a target are the same when using either the LOPAR or the HIPAR/AAR system. Target acquisition procedures are given in (1) through (7) below.

(1) The range MAN-AID switch on the target designate control-indicator is set to MAN.

(2) The acquisition range circle displayed on the PPI is increased or decreased in range until it coincides with the designated target video. The range circle is varied by operating the range SLEW switch and the range handwheel. When the range circle and target video coincide, the target has been roughly acquired in range.

(3) The azimuth switch on the target designate control-indicator is depressed, causing the existing PPI displays to be removed and the steerable azimuth line and acquisition range mark to be displayed on the PPI.

(4) The steerable azimuth line is rotated around the PPI until it coincides with the range mark. This line is adjusted by operating the azimuth knob (coarse) and azimuth knob (fine). When the steerable azimuth line is superimposed on the target video, the target has been roughly acquired in azimuth.

(5) After the target has been roughly acquired in range and azimuth, the target video is located on the precision indicator. The precision indicator presents an expanded portion of the PPI display around the target video. The steerable azimuth line and the range mark are now accurately positioned on the target video. On the precision indicator, the steerable azimuth line and the range mark are represented by fixed lines etched on the face of the indicator. When the fixed acquisition azimuth line and the fixed acquisition range line bisect the target video, the target has been acquired by the acquisition radar.

(6) The range MAN-AID switch is set to AID and the target is tracked in azimuth and range by maintaining the fixed acquisition range line and fixed acquisition azimuth line on the target video displayed on the precision indicator.

(7) The electrical position of the TTR antenna can be observed on the PPI by setting the TRACK CROSS switch to ON. Operation of the switch causes an electronic cross, representing the TTR antenna position, to be "painted" on the PPI. The switch can be used whenever it is necessary to observe the relative positions of the target and the TTR antenna.

i. Target Designation. After the target has been acquired and tracked by the acquisition radar, the target is designated to the TTR. Target designation is accomplished by operating the DESIGNATE-ABANDON switch on the target designate control-indicator to DESIGNATE. Operating this switch causes the following actions to occur.

(1) A buzzer on the target radar control console sounds to notify TTR operating personnel that a target has been designated and that the range and azimuth transfer voltages are available.

(2) The ivory DESIGNATE indicator light on the target track indicator assembly extinguishes and the green DESIGNATE indicator light illuminates.

(3) The ivory TARGET—DESIGNATED indicator light on the battery signal panel-indicator extinguishes and the green TARGET—DESIGNATED indicator light illuminates.

j. Target Acquisition by TTR. When the buzzer on the target radar control console sounds and the green TARGET—DESIGNATED indicator light illuminates, the TTR acquires the target as described in (1) through (6) below.

(1) The ACQUIRE switch on the target antenna control group is operated to ACQUIRE, causing the TTR azimuth and range circuits to slew to target azimuth and range coordinates received from the acquisition radar system. At the same time, the B scope indicator is reframed to center the target video in the display. The ivory CONFIRM indicator light on the target track indicator assembly extinguishes and the green CONFIRM indicator light illuminates. The ivory TARGET—CONFIRMED indicator light on the battery signal panel-indicator extinguishes and the green TARGET—CONFIRMED indicator light illuminates.

(2) The TTR azimuth and range coordinates are displayed on the B scope indicator as an antenna position circle. As the TTR azimuth and range circuits slew to the target azimuth and range coordinates, the antenna position circle approaches the target video.

(3) The azimuth MAN-AID-AUTO switch on the target antenna control group is set to MAN. The antenna position circle is alined with the target video in azimuth by rotating the azimuth handwheel.

(4) The RANGE TRACK switch on the target antenna control group is set to TTR. Operating the switch selects either the TTR or the TRR as the source of range information supplied to the computer. The TRR range circuits are used only when countermeasure activity is present.

(5) The range MAN-ACQUIRE AID-TRACK AID-AUTO switch is set to ACQUIRE AID. The antenna position circle is alined with the target video in range by rotating the range handwheel.

(6) When the TTR azimuth and range circuit values approximate target azimuth and range, the target video is centered in the antenna position circle on the B scope indicator.

(7) The elevation MAN-AID-AUTO switch on the target antenna control group is set to MAN in preparation

for acquiring the target in elevation. The TTR does not slew automatically to target elevation as it does for target azimuth and range. Target elevation is found by manually searching the target area after the target azimuth and range have been established. With the PRESENTATION switch set to the H_T position, the H_T scale is superimposed on the face of the scope and the presentation (dual traces) is deflected to indicate the elevation being scanned by the TTR. This elevation information aids the operator in slewing the TTR to the specified target area.

Note. **The operations described in (8) through (10) below are performed simultaneously.**

(8) The elevation SLEW switch is operated or the elevation handwheel is rotated until the error (lower) trace is positioned in the specified target area on the elevation indicator. The elevation handwheel is then rotated until the error "pip" on the lower trace of the elevation indicator is cancelled. When the error "pip" has been cancelled, the target has been acquired in elevation by the TTR.

(9) The target "pip" is then located on the upper trace of the azimuth indicator. The azimuth handwheel is rotated until the error "pip" on the lower trace of the azimuth indicator is cancelled. When the error "pip" has been cancelled, the target has been acquired in azimuth by the TTR.

(10) The target "pip" is located on the target range indicator, and the range handwheel is rotated until the target video is centered over the range notch displayed on the target range indicator. When the target "pip" has been centered over the range notch, the target has been acquired in range by the TTR.

(11) The elevation MAN—AID—AUTO switch on the target antenna control group is set to AID and the target is tracked in elevation by rotating the elevation handwheel to keep the error "pip" cancelled.

(12) The azimuth MAN—AID—AUTO switch is set to AID and the target is tracked in azimuth by rotating the azimuth handwheel to keep the error "pip" cancelled.

(13) The range MAN—ACQUIRE AID—TRACK AID—AUTO switch is set to TRACK AID, and the target is tracked in range by keeping the target video centered over the range notch with the aid of the handwheel.

(14) When the designated target is reported tracked by the TTR in azimuth, range, and elevation, the TRACKED switch on the target antenna control group is depressed, causing the ivory TARGET—TRACKED indicator light on the battery signal panel-indicator to extinguish and the green TARGET—TRACKED indicator light to illuminate. The ivory TRACK indicator light on the target track indicator assembly also extinguishes and the green TRACK indicator light illuminates.

(15) If the target is lost by the TTR, the target can be redesignated by the acquisition radar. The OFF TARGET switch on the target antenna control group is depressed, causing the green TRACK indicator light on the target track indicator assembly to extinguish and the ivory TRACK indicator light to illuminate. The green TARGET—TRACKED indicator light on the battery signal panel-indicator also extinguishes and the ivory TARGET—TRACKED indicator light illuminates. When the ivory TARGET—TRACKED indicator light on the battery signal panel-indicator illuminates, the target is redesignated by using the procedure given in *i* above.

k. Target Evaluation. In order to effectively defend an area against enemy attack, it is important to evaluate the maneuverability of the designated target and to determine the number of hostile aircraft involved if the designated target is a multiple target. It is the responsibility of the Improved NIKE-HERCULES Systems to determine these factors. When the size of a multiple target has been estimated, the AADCP is informed so that additional Improved NIKE-HERCULES Systems can be designated or other action taken to ensure de-

struction of the target. Target maneuverability and numerical size information is also used to condition the computer so that maximum kill probability can be obtained. The procedure for determining target characteristics and conditioning the computer is given in (1) through (4) below.

(1) If a multiple target is designated, the number of aircraft is established by viewing the size and intensity of the target video displayed on the precision indicator or the B scope indicator which present magnified views of the target area displayed on the PPI. The estimate is reported to the director station where the ONE switch, FEW switch, or MANY switch on the tactical control-indicator is depressed. When one of these switches is depressed, a signal corresponding to the estimated number of aircraft is sent to the AADCP, and the ONE indicator light, FEW indicator light, or MANY indicator light on the tactical control-indicator illuminates.

(2) If the MULTIPLE TARGET switch on the battery signal panel-indicator is depressed, circuits are activated in the computer to smooth out steering commands given to the missile. As a result, the missile is guided to intercept the target group rather than an individual target within the group. Also, the MANEUVER indicator light on the battery signal panel-indicator extinguishes and the MULTIPLE TARGET indicator light illuminates.

(3) If the NON-MANEUVER switch on the battery signal panel-indicator is depressed, circuits in the computer are activated to limit the amplitude of steering orders given to the missile. Limiting of steering order amplitude prevents the missile from reacting fully to momentary changes in target heading and velocity, and enables the missile to intercept the target with a minimum amount of maneuvering. Depressing the switch also causes the MANEUVER indicator light on the battery signal panel-indicator to extinguish and the NON-MANEUVER indicator light to illuminate.

(4) If the MANEUVER switch on the battery signal panel-indicator is depressed, circuits in the computer are conditioned for action against highly maneuverable targets. Since "maneuver" is the normal computer condition, the switch is used only to return the computer to normal after being conditioned for "multiple target" or "non-maneuver" operation. The MULTIPLE TARGET indicator light or the NON-MANEUVER indicator light on the battery signal panel-indicator extinguishes and the MANEUVER indicator light illuminates.

l. Missile Acquisition. When the MISSILE READY and LOCAL DESIGNATE switches are set to on (up), preparations for launching have been completed in the launching area, and a launcher and launching section have been selected by launching area personnel; the green MISSILE READY indicator light on the battery signal panel-indicator and the green READY indicator light on the missile control-indicator group illuminate to show that the selected missile is ready for acquisition by the MTR. The procedure for acquisition of the missile is given in (1) through (8) below.

(1) The DISABLE switch is set to off (down) to enable the coast circuits in the MTR.

(2) When the TEST switch is set to off (down), the positioning voltage from the selected launcher position control located behind the side access door causes the missile tracking radar system to automatically slew to the coordinates of the selected missile in range, azimuth, and elevation.

(3) When the TUNE-SLEW switch is set to the SLEW position, the FREQUENCY meter indicates the correct preselected tuned cavity number on the SLEW scale. When the TUNE-SLEW switch is set to the TUNE position, the FREQUENCY meter indi-

for acquiring the target in elevation. The TTR does not slew automatically to target elevation as it does for target azimuth and range. Elevation of the target is found by manually searching the target area after the target azimuth and range have been established.

Note. The operations described in (8) through (10) below are performed simultaneously.

(8) The elevation SLEW switch is operated or the elevation handwheel is rotated until the target "pip" appears on the upper trace of the elevation indicator. The elevation handwheel is then rotated until the error "pip" on the lower trace of the elevation indicator is cancelled. When the error "pip" has been cancelled, the target has been acquired in elevation by the TTR.

(9) The target "pip" is then located on the upper trace of the azimuth indicator. The azimuth handwheel is rotated until the error "pip" on the lower trace of the azimuth indicator is cancelled. When the error "pip" has been cancelled, the target has been acquired in azimuth by the TTR.

(10) The target "pip" is located on the target range indicator, and the range handwheel is rotated until the target video is centered over the range notch displayed on the target range indicator. When the target "pip" has been centered over the range notch, the target has been acquired in range by the TTR.

(11) The elevation MAN-AID-AUTO switch on the target antenna control group is set to AID and the target is tracked in elevation by rotating the elevation handwheel to keep the error "pip" cancelled.

(12) The azimuth MAN-AID-AUTO switch is set to AID and the target is tracked in azimuth by rotating the azimuth handwheel to keep the error "pip" cancelled.

(13) The range MAN-ACQUIRE AID-TRACK AID-AUTO switch is set to TRACK AID, and the target is tracked in range by keeping the target video centered over the range notch with the aid of the handwheel.

(14) When the designated target is reported tracked by the TTR in azimuth, range, and elevation, the TRACKED switch on the target antenna control group is depressed, causing the ivory TARGET—TRACKED indicator light on the battery signal panel-indicator to extinguish and the green TARGET—TRACKED indicator light to illuminate. The ivory TRACK indicator light on the target track indicator assembly also extinguishes and the green TRACK indicator light illuminates.

(15) If the target is lost by the TTR, the target can be redesignated by the acquisition radar. The OFF TARGET switch on the target antenna control group is depressed, causing the green TRACK indicator light on the target track indicator assembly to extinguish and the ivory TRACK indicator light to illuminate. The green TARGET—TRACKED indicator light on the battery signal panel-indicator also extinguishes and the ivory TARGET—TRACKED indicator light illuminates. When the ivory TARGET—TRACKED indicator light on the battery signal panel-indicator illuminates, the target is redesignated by using the procedure given in *i* above.

k. Target Evaluation. In order to effectively defend an area against enemy attack, it is important to evaluate the maneuverability of the designated target and to determine the number of hostile aircraft involved if the designated target is a multiple target. It is the responsibility of the Improved NIKE-HERCULES Systems to determine these factors. When the size of a multiple target has been estimated, the AADCP is informed so that additional Improved NIKE-HERCULES Systems can be designated or other action taken to ensure de-

struction of the target. Target maneuverability and numerical size information is also used to condition the computer so that maximum kill probability can be obtained. The procedure for determining target characteristics and conditioning the computer is given in (1) through (4) below.

(1) If a multiple target is designated, the number of aircraft is established by viewing the size and intensity of the target video displayed on the precision indicator or the B scope indicator which present magnified views of the target area displayed on the PPI. The estimate is reported to the director station where the ONE switch, FEW switch, or MANY switch on the tactical control-indicator is depressed. When one of these switches is depressed, a signal corresponding to the estimated number of aircraft is sent to the AADCP, and the ONE indicator light, FEW indicator light, or MANY indicator light on the tactical control-indicator illuminates.

(2) If the MULTIPLE TARGET switch on the battery signal panel-indicator is depressed, circuits are activated in the computer to smooth out steering commands given to the missile. As a result, the missile is guided to intercept the target group rather than an individual target within the group. Also, the MANEUVER indicator light on the battery signal panel-indicator extinguishes and the MULTIPLE TARGET indicator light illuminates.

(3) If the NON-MANEUVER switch on the battery signal panel-indicator is depressed, circuits in the computer are activated to limit the amplitude of steering orders given to the missile. Limiting of steering order amplitude prevents the missile from reacting fully to momentary changes in target heading and velocity, and enables the missile to intercept the target with a minimum amount of maneuvering. Depressing the switch also causes the MANEUVER indicator light on the battery signal panel-indicator to extinguish and the NON-MANEUVER indicator light to illuminate.

(4) If the MANEUVER switch on the battery signal panel-indicator is depressed, circuits in the computer are conditioned for action against highly maneuverable targets. Since "maneuver" is the normal computer condition, the switch is used only to return the computer to normal after being conditioned for "multiple target" or "non-maneuver" operation. The MULTIPLE TARGET indicator light or the NON-MANEUVER indicator light on the battery signal panel-indicator extinguishes and the MANEUVER indicator light illuminates.

l. Missile Acquisition. When the MISSILE READY and LOCAL DESIGNATE switches are set to on (up), preparations for launching have been completed in the launching area, and a launcher and launching section have been selected by launching area personnel; the green MISSILE READY indicator light on the battery signal panel-indicator and the green READY indicator light on the missile control-indicator group illuminate to show that the selected missile is ready for acquisition by the MTR. The procedure for acquisition of the missile is given in (1) through (8) below.

(1) The DISABLE switch is set to off (down) to enable the coast circuits in the MTR.

(2) When the TEST switch is set to off (down), the positioning voltage from the selected launcher position control located behind the side access door causes the missile tracking radar system to automatically slew to the coordinates of the selected missile in range, azimuth, and elevation.

(3) When the TUNE-SLEW switch is set to the SLEW position, the FREQUENCY meter indicates the correct preselected tuned cavity number on the SLEW scale. When the TUNE-SLEW switch is set to the TUNE position, the FREQUENCY meter indi-

cates in the white section of the TUNE scale. The OFF FREQ indicator light does not illuminate.

(4) The missile "pip" (3, fig. 119) is centered in the 100-yard range notch (4, fig. 119) on the range indicator (10, fig. 30); the AZIMUTH ERROR and ELEVATION meters on the missile track indicator indicate a minimum deflection; and the COAST indicator light on the missile track control drawer extinguishes.

(5) When the MTR has locked on the missile in azimuth, elevation, and range, the ivory TRACK indicator light on the missile control-indicator group automatically extinguishes and the green TRACK indicator light illuminates. The ivory MISSILE-TRACKED indicator light on the battery signal panel-indicator also extinguishes and green MISSILE-TRACKED indicator light illuminates. Illumination of the green indicator lights indicates that the missile is ready to launch.

(6) If the green TRACK indicator light does not automatically illuminate, the RECEIVED SIGNAL meter on the missile control-indicator group is monitored to determine if the beacon signal strength and stability are adequate to carry out an engagement.

(7) If the missile beacon signal is considered adequate after viewing the indication on the RECEIVED SIGNAL meter, the TRACKED switch on the missile track control drawer is depressed causing the following events to occur.

(*a*) The ivory TRACK indicator light on the missile control-indicator group extinguishes and the green TRACK indicator light illuminates.

(*b*) The ivory MISSILE-TRACKED indicator light on the battery signal panel-indicator extinguishes and the green MISSILE-TRACKED indicator light illuminates.

(8) If the missile beacon signal is considered inadequate after viewing the indication on the RECEIVED SIGNAL meter, the REJECT switch on the missile track control drawer is depressed causing the following events to occur.

(*a*) The green READY indicator light on the missile control-indicator group extinguishes, and the ivory READY indicator light illuminates.

(*b*) The green MISSILE-READY indicator light on the battery signal panel-indicator extinguishes, and the ivory MISSILE-READY indicator light illuminates.

(*c*) Upon notification in the launching area that the selected missile has been rejected, the launching area personnel must designate a new missile or the flight simulator if another missile has not been prepared. The MTR will slew to the next designated missile or the flight simulator.

Note. When a missile is rejected and a new missile is designated, the procedure in (1) through (8) above must be repeated.

m. Ready to Fire. The Improved NIKE-HERCULES System is ready to fire when the target is tracked, the missile is tracked, and the computer has stabilized. When these conditions are met, the ivory READY TO FIRE indicator light on the battery signal panel-indicator extinguishes and the green READY TO FIRE indicator light illuminates.

n. Launching. After the green READY TO FIRE indicator light illuminates, the missile can be fired. The time of firing is determined by knowledge of system capabilities and information displayed on the altitude plotting board (8, fig. 22) and the horizontal plotting board (21, fig. 22). The launching sequence is given in (1) through (5) below.

(1) The altitude plotting board plots the altitude of the predicted point of intercept and time to intercept with the right pen.

Note. Target altitude can be monitored on the PRESENT TARGET ALTITUDE meter.

(2) The horizontal plotting board plots the target azimuth and target range with one pen and plots the azimuth and range of the predicted point-of-intercept with the other pen.

(3) When the target range, altitude, and time-to-intercept fall within the intercept capabilities of the Improved NIKE-HERCULES System the FIRE switch on the tactical control-indicator is operated to the fire position (up). Operation of the switch causes the following events to occur.

(*a*) A fire order is sent to the launching area by the computer.

(*b*) The ivory FIRE indicator light on the battery signal-panel-indicator extinguishes and the green FIRE indicator light illuminates.

(*c*) The ivory FIRE indicator light on the target track indicator assembly extinguishes and the green FIRE indicator light illuminates.

(*d*) The ivory FIRE indicator light on the missile control-indicator group extinguishes and the green FIRE indicator light illuminates.

(4) After a few seconds delay for missile gyro stabilization, the missile leaves the launcher. The computer detects the missile movement and generates a missile away signal which causes the following events to occur.

(*a*) The ivory LAUNCH indicator light on the battery signal panel-indicator extinguishes and the green LAUNCH indicator light illuminates.

(*b*) The ivory LAUNCH indicator light on the target track indicator assembly extinguishes and the green LAUNCH indicator light illuminates.

(*c*) The ivory LAUNCH indicator light on the missile control-indicator group extinguishes and the green LAUNCH indicator light illuminates.

(*d*) If missile away is not detected within 5 seconds after the fire order is issued, the computer automatically rejects the missile and another missile must be designated by the launching area personnel to complete the engagement.

(*e*) The right pen of the altitude plotting board stops plotting the predicted point of intercept and begins plotting target altitude against time. The left pen begins plotting missile altitude against time.

(*f*) The horizontal plotting board stops recording the predicted point-of-intercept and begins to record the missile azimuth plotted against missile range.

(5) If the missile tracking radar system loses the missile during automatic tracking, the COAST indicator light illuminates. The missile tracking radar system continues to automatically track the missile for approximately 3 seconds at the existing tracking rates. If the missile is reacquired during this 3-second period, the missile tracking radar system continues to transmit steering orders to the missile. If the missile is not reacquired, the missile fail-safes, and the missile tracking radar system automatically slews to the next designated missile or to the flight simulator in the launching area.

o. Intercept. After launching, the missile is automatically guided to intercept the target by steering orders from the computer. The computer develops steering orders from target and missile position data which is supplied by the target and missile tracking radar systems. Steering orders are transmitted to the missile by the MTR. The sequence of events during intercept phase is given in (1) and (2) below.

(1) The altitude plotting board, horizontal plotting board, TARGET GROUND SPEED meter, MISSILE SPEED meter, and PRESENT TARGET ALTITUDE meter are monitored to follow the progress of the target and missile toward intercept.

Note. The missile can be burst prior to intercept by operating either BURST switch or FRIEND switch on the tactical control-indicator.

(2) When the missile is a predetermined distance from the target, the computer sends a burst order to the missile. Transmission of the burst order causes the following events to occur.

(*a*) The warhead in the missile is detonated.

(*b*) The ivory BURST indicator light on the battery signal panel-indicator extinguishes and the green BURST indicator light illuminates.

(*c*) The ivory BURST indicator light on the target track indicator group extinguishes and the green BURST indicator light illuminates.

(*d*) The ivory BURST indicator light on the missile control-indicator group extinguishes and the green BURST indicator light illuminates.

p. Post Intercept. After the missile bursts, the effectiveness of the engagement is determined and the Improved NIKE-HERCULES System is prepared for the next designated target and missile. The sequence of events following missile burst is given in (1) through (7) below.

(1) The MTR automatically slews to the next designated missile or the flight simulator in the launching area.

(2) The green BURST indicator light, LAUNCH indicator light, FIRE indicator light, READY TO FIRE indicator light, and MISSILE—TRACKED indicator light on the battery signal panel-indicator are extinguished and the ivory BURST indicator light, LAUNCH indicator light, FIRE indicator light, READY TO FIRE indicator light, and MISSILE—TRACKED indicator light are illuminated.

(3) The green BURST indicator light, LAUNCH indicator light, and FIRE indicator light on the target track indicator assembly are extinguished and the ivory BURST indicator light, LAUNCH indicator light, and FIRE indicator light are illuminated.

(4) The green BURST indicator light, LAUNCH indicator light, FIRE indicator light, and TRACK indicator light on the missile control-indicator group are extinguished and the ivory BURST indicator light, LAUNCH indicator light, FIRE indicator light, and TRACK indicator light are illuminated.

(5) The DESIGNATE–ABANDON switch on the target designate control-indicator is operated to ABANDON. Operation of the switch causes the green TARGET—TRACKED indicator light, TARGET—CONFIRMED indicator light, TARGET—DESIGNATED indicator light, and TARGET—FOE indicator light on the battery signal panel-indicator to extinguish and the ivory TARGET—TRACKED indicator light, TARGET—CONFIRMED indicator light, TARGET—DESIGNATED indicator light, and TARGET—FOE indicator light to illuminate. The green TRACK indicator light, CONFIRM indicator light, and DESIGNATE indicator light on the target track indicator group extinguish and the ivory TRACK indicator light, CONFIRM indicator light, and DESIGNATE indicator light illuminate. Illumination of the ivory indicator lights indicates that the TTR has been cleared for designation of a new target.

(6) The TARGET MISSILE switch on the computer control-panel is set to IND ERROR AT BURST YDS/10 and the missile position error at burst in X, Y, and H coordinates is read on the ACCELERATION, VELOCITY AND POSITION DIFFERENCE—X, G_Y meter, ACCELERATION, VELOCITY AND POSITION DIFFERENCE—Y, G_P meter, and ACCELERATION, VELOCITY AND POSITION DIFFERENCE—H, G_T meter. The meter readings are used to determine the effectiveness of the engagement.

(7) The meter readings obtained in (6) above are compared with established standards which correlate the amount of target damage expected when the missile bursts at various distances from the target. When the amount of target damage has been determined, the EFFECTIVE switch, KILL switch, or INEFFECTIVE switch on the tactical control-indicator is depressed to signal to the AADCP the amount of target damage. If the EFFECTIVE switch is depressed, the EFFECTIVE indicator light will illuminate, and if the INEFFECTIVE switch is depressed, the INEFFECTIVE indicator light will illuminate. Indicator lights are not used with the KILL switch.

(8) When the events described in (1) through (7) above have occurred, the surface-to-air engagement cycle has been completed and the Improved NIKE-HERCULES System is ready for another engagement.

150 (C). Surface-to-Surface Mission

a. Surface-to-Surface Engagement. In normal surface-to-surface engagements, orders for surface fire originate at The Army Operations Center and are relayed to the AADCP which provides tactical control for individual Improved NIKE-HERCULES Systems. When a surface-to-surface mission is ordered, the AADCP sends the computed equipment settings for the engagement to the designated Improved NIKE-HERCULES System. The TTR is locked on the displaced aiming point, the MTR is set for the proper guidance cutoff, and fixed constants on the engagement are programmed into the computer. After launching, the missile is guided toward the fixed displaced aiming point which represents the target coordinates. At a predetermined time before the missile reaches the displaced aiming point, a final dive order is issued to the missile. The final dive order causes the missile to dive toward the target and onto a ballistic trajectory. Just before the missile reaches the radar masking line in its descent toward the target, guidance commands are terminated and the barometric fuze in the missile is armed. After guidance cutoff, the missile follows a ballistic trajectory until it reaches a predetermined altitude above the target. At this altitude, which has been calculated as the optimum detonation altitude for the type of missile warhead used and the type of target designated, the warhead is exploded by the barometric fuze in the missile. After warhead detonation, the Improved NIKE-HERCULES System is prepared for the next engagement. The procedures used in a surface-to-surface engagement are given in *b* through *p* below.

b. Initial Procedure. When instructions for a surface-to-surface mission are received from the AADCP, the Improved NIKE-HERCULES System is placed in blue alert status. In blue alert status the procedures given in (1) and (2) below are followed.

(1) All operating personnel man their equipment and perform the blue equipment status checks and adjustments specified in the SOP.

(2) The MISSILES PREPARED switch on the battery signal panel-indicator is set to B-XS and B-XL to determine the number of missiles in each missile-warhead configuration that are available for the engagement. The number of missiles available in each configuration is indicated on the MISSILES PREPARED meter when the switch is set to each position.

c. Mission and Missile Selection. The mission has been previously determined as a surface-to-surface (SS) type. Either the B-XS or B-XL missile-warhead configuration can be used in SS mission. The procedures for selecting the mission and missile and the procedures for conditioning the Improved NIKE-HERCULES System for the selected mission and missile are given in (1) through (3) below.

(1) The MISSION switch on the battery signal panel-indicator is depressed and set to SS. Setting the switch activates circuits that automatically condition the RCDC for SS operation and illuminates the MISSION—SS indicator

light on the battery signal panel-indicator.

(2) When the Improved NIKE-HERCULES System is integrated with the MISSILE MONITOR (AN/MGS-4), the MISSILE—REM—B-XS indicator light, or the MISSILE—REM—B-XL indicator light on the battery signal panel-indicator will illuminate to indicate the type of missile-warhead combinations to use in the engagement. The REMOTE indicator light on the tactical control-indicator also illuminates to indicate that a command has been issued by the AADCP. When illumination of this indicator light is observed, the ACKNOW switch is depressed, sending an acknowledgment signal to the AADCP and extinguishing the REMOTE indicator light. After acknowledging the signal from the AADCP, the MISSILE switch is set to the position corresponding to the illuminated indicator light. Setting this switch initiates the following events.

(*a*) A signal is sent to the missile tracking radar system to condition it for the type of missile selected and the MISSILE—NIKE B indicator light on the missile control-indicator group illuminates to notify operating personnel that a NIKE-HERCULES missile has been selected for the engagement.

(*b*) A signal is sent to the computer to condition it for the type of missile and warhead selected.

(*c*) The altitude plotting board on the battery control console is illuminated by red lights.

(3) If the engagement is to be locally controlled, the MISSILE switch on the battery signal panel-indicator is set to B-XS or B-XL in accordance with instructions from the AADCP or the SOP. The corresponding MISSILE—BTRY—B-XS indicator light or MISSILE—BTRY—B-XL indicator light on the battery signal panel-indicator illuminates. Setting the switch indicates the events described in 2 (*a*) through (*c*) above.

d. Equipment Conditioning. The procedures for conditioning the computer, MTR, and launching area for action after the selection of the mission and missile are given in paragraph 149*d*.

e. Launching Area Procedures. After receiving the mission and missile data from the RCDC, launching area personnel prepare the missiles which meet the selected missile requirements for a surface-to-surface engagement. After preparations have been completed, the barometric fuzes are set for the altitude specified by the RCDC.

f. Guidance Cutoff Setting. Normally, in surface-to-surface engagements, targets are located below the radar line of sight between the missile and the MTR. The radar line of sight is broken at low antenna elevation position due to radar masking caused by obstructions between the target and the MTR antenna. If this line of sight is broken while the missile is receiving guidance commands, the missile will fail-safe. To prevent fail-safe, guidance commands sent to the missile by the computer are terminated before the radar line of sight is broken by a guidance cutoff signal generated when the guidance cutoff switch on the MTR antenna is actuated. This switch is actuated when the antenna lowers in elevation to the preset guidance cutoff angle. The procedure for setting the guidance cutoff switch to the proper angle for the engagement is given in (1) through (6) below.

(1) The local antenna control, which is used to vary the antenna elevation angle, is connected to the LOCAL ANTENNA CONTROL UNIT connector J7 on the curbside of the azimuth drive equipment enclosure.

(2) The elevation dial illumination switch S1 on the track antenna support is depressed to illuminate the elevation dial on the elevation position transmitter.

(3) The ELEVATION knob and the elevation INCREASE-DECREASE switch on the local antenna control are oper-

ated until the guidance cutoff angle for the engagement is visible in the elevation dial eyepiece.

(4) The locking screw is loosened to unlock the guidance cutoff switch setting, and the adjustment screw is turned fully counterclockwise ensuring that the switch is adjusted to an angle less than the antenna.

(5) The adjustment screw is then slowly turned clockwise until the threshold light illuminates, indicating that the guidance cutoff switch is set to operate at the preset antenna elevation angle.

(6) The locking screw is tightened to lock the guidance cutoff switch setting.

g. Target Coordinate Settings. In a surface-to-surface engagement, the target is stationary and the TTR does not track the target. In order to supply the computer with target position information, the TTR is manually locked in azimuth, elevation, and range on a fixed displaced aiming point which represents the target coordinates for the engagement. The procedure for locking the TTR on the displaced aiming point is given in (1) through (9) below.

(1) The local antenna control is connected to the LOCAL ANTENNA CONTROL UNIT connector J7 on the curbside of the target track antenna support base.

(2) The elevation dial illumination switch S1 on the track antenna pedestal is depressed to illuminate the elevation dial on the elevation position transmitter.

(3) The ELEVATION knob and the elevation INCREASE-DECREASE switch on the local antenna control are operated until the specified antenna elevation angle for the engagement is visible in elevation dial eyepiece.

(4) After the antenna has been set to the specified elevation angle, the COORDINATE LOCK—ELEV switch on the electric light control is set to on position (up) to lock the antenna in elevation.

(5) The AZIMUTH knob and the azimuth INCREASE-DECREASE switch on the local antenna control are operated until the specified antenna azimuth angle is indicated on the azimuth dial.

(6) After the antenna has been set to the specified azimuth angle, the COORDINATE LOCK—AZ switch is set to on position (up) to lock the antenna in azimuth.

(7) The range MAN-ACQUIRE AID-TRACK AID-AUTO switch on the target antenna control group is set to MAN.

(8) The range handwheel is rotated until the range dial on the target range position transmitter indicates the specified range setting.

(9) After the TTR range circuits have been set to the specified range, the COORDINATE LOCK—RANGE switch on the electric light control is set to on position (up) to lock the TTR range circuits.

h. Computer Settings. When the MISSION switch is set to SS, the computer is automatically conditioned for a surface-to-surface engagement. However, the height displacement and final dive time must be manually set into the computer. The height displacement is the altitude of the displaced aiming point, and the final dive time is the predetermined time on the missile trajectory when the missile will start its final dive toward the target. The procedure for setting the computer for the height displacement and the final dive time is given in (1) and (2) below.

(1) The HT DISPLACE knob on the servo computer assembly is turned until the specified altitude of the displaced aiming point for the engagement is indicated on the HT DISPLACE dial.

(2) The FINAL DIVE TIME knob on the servo computer assembly is turned until the specified final dive time for the engagement is indicated on the FINAL DIVE TIME dial.

i. Identification and Designation of Targets. The interrogation and identification of targets as friend or foe by the SIF/IFF system or FUIF system and designation of targets for the target tracking radar system are not re-

quired for surface-to-surface operation since MISSION instructions for the surface target to be engaged are supplied by the AADCP. However, the FOE switch on the IFF control-indicator must be depressed and the DESIGNATE-ABANDON switch on the target designate control-indicator must be set to DESIGNATE before the missile firing circuit can be completed. The events given in (1) and (2) below occur when these switches are operated.

(1) When the FOE switch is depressed, the ivory TARGET—FOE indicator light on the battery signal panel-indicator extinguishes and the green TARGET—FOE indicator light illuminates.

(2) When the DESIGNATE-ABANDON switch is set to DESIGNATE, the ivory TARGET-DESIGNATED indicator light on the battery signal panel-indicator extinguishes and the green TARGET-DESIGNATED indicator light illuminates. The ivory DESIGNATE indicator light on the target track indicator assembly extinguishes and the green DESIGNATE indicator light illuminates.

(3) The ACQUIRE switch need not be used since the target coordinates are present; however, the TRACKED switch must be operated to energize associated circuits in the computer.

j. Missile Acquisition. The procedure for missile acquisition by MTR is the same for surface-to-surface and surface-to-air missions. This procedure is given in paragraph 149*l*.

k. Red Alert. After a surface-to-surface mission has been assigned to an Improved NIKE-HERCULES System and the MTR, TTR, and computer have been conditioned for the engagement, the system is placed in red alert status using the procedures given in paragraph 149*e*.

l. Ready to Fire. The Improved NIKE-HERCULES System is ready to fire a surface-to-surface mission when the TTR is locked on the displaced aiming point, the MTR antenna is set for the proper guidance cutoff angle, the missile is tracked, the computer is programmed for height displacement and final dive time, and the computer has stabilized. When these conditions have been met, the ivory READY TO FIRE indicator light on the battery signal panel-indicator extinguishes and the green READY TO FIRE indicator light illuminates.

m. Launching. After the green READY TO FIRE indicator light illuminates, the missile can be fired. The time of firing is determined by the scheduled time on target for the missile and the predicted time of flight. The launching sequence is given in paragraph 149*n*.

n. Guidance Cutoff. After launching, the missile is automatically guided toward the target until the guidance cutoff point is reached. When this point is reached, a burst command is issued to the missile by the computer, and the events given in (1) through (4) below occur.

(1) The barometric fuze in the missile is armed and guidance commands to the missile are terminated.

(2) The ivory BURST indicator light on the battery signal panel-indicator extinguishes and the green BURST indicator light illuminates.

(3) The ivory BURST indicator light on the target track indicator group extinguishes and the green BURST indicator light illuminates.

(4) The ivory BURST indicator light on the missile control-indicator group extinguishes and the green BURST indicator light illuminates.

(5) The TARGET MISSILE switch on the computer control-panel is set to IND ERROR AT BURST YDS/10 and the missile position error at burst command in X, Y, and H coordinates is read on the ACCELERATION, VELOCITY AND POSITION DIFFERENCE—X, G_T meter, ACCELERATION, VELOCITY AND POSITION DIFFERENCE—Y, G_P meter, and ACCELERATION, VELOCITY AND POSITION DIFFERENCE—H, G_T meter. The meter readings are used to determine the effectiveness of the engagement.

(6) The meter readings obtained in (5) above are compared with established standards which correlate the amount of target damage expected when the

missile receives a burst command at various distances from the programmed guidance cutoff point. When the amount of target damage has been estimated, the results are reported to the AADCP.

o. Missile Burst. After guidance cutoff, the missile falls freely toward the target until it reaches the predetermined detonation altitude. When this altitude is reached, the missile warhead is automatically exploded by the barometric fuze.

p. Post Missile Burst. After missile burst, the Improved NIKE–HERCULES System is prepared for another engagement. The sequence of events following missile burst is given in (1) through (7) below.

(1) The MTR automatically slews to the flight simulator in the launching area.

(2) The green BURST indicator light, LAUNCH indicator light, FIRE indicator light, READY TO FIRE indicator light, and MISSILE—TRACKED indicator light on the battery signal panel-indicator are extinguished and the ivory BURST indicator light, LAUNCH indicator light, FIRE indicator light, READY TO FIRE indicator light, and MISSILE—TRACKED indicator light are illuminated.

(3) The green BURST indicator light, LAUNCH indicator light, and FIRE indicator light on the target track indicator assembly are extinguished and the ivory BURST indicator light, LAUNCH indicator light, and FREE indicator light are illuminated.

(4) The green BURST indicator light, LAUNCH indicator light, FIRE indicator light, and TRACK indicator light on the missile control-indicator group are extinguished and the ivory BURST indicator light, LAUNCH indicator light, and FIRE indicator light, and TRACK indicator light are illuminated.

(5) The DESIGNATE–ABANDON switch on the target designate control-indicator is operated to ABANDON. Operation of the switch causes the green TARGET—TRACKED indicator light, TARGET—CONFIRMED indicator light, TARGET—DESIGNATED indicator light, and TARGET—FOE indicator light on the battery signal panel-indicator to extinguish and the ivory TARGET—TRACKED indicator light, TARGET—CONFIRMED indicator light, TARGET—DESIGNATED indicator light, and TARGET—FOE indicator light to illuminate. The green TRACK indicator light, CONFIRM indicator light, and DESIGNATE indicator light on the target track indicator group extinguish and the ivory TRACK indicator light, CONFIRM indicator light, and DESIGNATE indicator light illuminate. Illumination of the ivory indicator lights indicates that the TTR has been cleared for designation of a new target.

(6) The COORDINATE LOCK—ELEV switch, COORDINATE LOCK—AZ switch, and COORDINATE LOCK—RANGE switch on the electric light control are set to off position (down) to unlock the TTR elevation, azimuth, and range circuits.

(7) When the events described in (1) through (6) above have occurred, the surface-to-surface engagement cycle has been completed and the Improved NIKE–HERCULES System is ready for another engagement.

151 (U). Firing Data

Firing data to be used in a surface-to-surface mission are presented in Department of the Army Firing Table HERCULES A–1 and within this technical manual.

152 (U). Computer Input Data Nomogram

a. The results of NIKE–HERCULES simulated surface-to-surface trajectories were used to derive gravity corrections, height displacements (H_D), maximum guidance cutoff angles (MAX ϕ_L), and final dive times (FDT) (fig. 123).

b. Data presented in the nomogram was derived assuming the parallax between the

launcher and the radars to be zero. Also, the launcher, radars, and target were considered as being at sea level.

c. Gravity corrections under 10 yards may be neglected; therefore, the R_L scale on the right reflects only ranges where gravity correction values may be significant. Nomogram scales do not reveal system limitations.

d. Gravity correction may be read by laying a straightedge from the ϕ_L scale to the R_L scale on the right through to the gravity correction scale, as indicated by the dashed line.

e. Height displacement (H_D), maximum guidance cutoff angle (MAX ϕ_L), and final dive time (FDT) corresponding to specific R_L values are read from scales adjacent and corresponding to the R_L scale on the left.

153 (U). Altitude Correction Nomogram

a. Altitude correction nomogram (fig. 124) prescribes the correction to the surface-to-surface firing range based on true ground distance (R_s) and average target tracking radar/target altitude. See TM 5–241–2 for detailed discussion and need for this correction.

b. The altitude correction nomogram may be read by laying a straightedge from the R_s scale to the average TTR/target altitude scale through to the altitude correction scale.

Note. No correction is required for values of average TTR/target altitude or values of R_s less than those reflected in the nomogram.

154 (C). Minimum Guidance Cutoff Set

a. Minimum guidance cutoff set, table 86, prescribes the minimum allowable GCO settings

Table 86 (C). Minimum Guidance Cutoff Set[1] (U)

True ground distance TTR-to-target (Rs) (yards)	Minimum guidance cutoff set (GCO SET) (mils)	True ground distance TTR-to-target (Rs) (yards)	Minimum guidance cutoff set (GCO SET) (mils)
33,000	59	68,000	29
34,000	57	69,000	28
35,000	55	70,000	28
36,000	53	71,000	28
37,000	51	72,000	27
38,000	50	73,000	27
39,000	48	74,000	27
40,000	47	75,000	26
41,000	46	76,000	26
42,000	45	77,000	26
43,000	44	78,000	25
44,000	43	79,000	25
45,000	42	80,000	25
46,000	41	81,000	25
47,000	40	82,000	24
48,000	39	83,000	24
49,000	38	84,000	24
50,000	38	85,000	24
51,000	37	86,000	23
52,000	36	87,000	23
53,000	36	88,000	23
54,000	35	89,000	23
55,000	34	90,000	22
56,000	34	91,000	22
57,000	33	92,000	22
58,000	33	93,000	22
59,000	32	94,000	21
60,000	32	95,000	21
61,000	31	96,000	21
62,000	31	97,000	21
63,000	30	98,000	21
64,000	30	99,000	21
65,000	30	100,000	20
66,000	29		
67,000	29		

[1] Minimum GCO SET for all ranges greater than 100,000 yards is 20 mils.

that may be set in at the missile tracking radar. This is required to allow final arming of the warhead from guidance cutoff to burst.

b. Minimum guidance cutoff set for all ranges greater than 100,000 yards is 20 angular mils.

155 (C). Altitude of Burst Correction

A dynamic lag in the barometric fuze line requires that a correction be made to the equivalent altitude of burst. The value of this correction is minus 373 feet.

156 (C). Symbology and Data Utilization

a. H_D (height displacement) is utilized as prescribed in paragraph 150*h*.

b. At least 10 seconds of final guidance must be obtained before the guidance cutoff point is reached. Therefore, a maximum guidance cutoff angle that may be set in at the missile tracking radar is prescribed. MAX ϕ_L is the symbol for this quantity. This is utilized as prescribed in FM 44–95.

c. FDT (final dive time) is utilized as prescribed in paragraph 150*h*.

d. R_L (launcher-to-target radar plane range) is used as an argument in computer input data nomogram (fig. 123). It is calculated and further utilized as prescribed in FM 44–95.

e. ϕ_L (launcher cutoff angle) equals guidance cutoff angle (GCO) in the simulations per assumptions outlined in paragraph 152. For field use, however, launcher cutoff angle is defined by the equation

$$\phi_L = (GCO - Si)\frac{R_s}{R_L}$$

where $GCO = \text{radar mask} + 5 \text{ angular mils}$

$$(\text{angle of site})\ Si = \frac{H_t - H_{tt}}{R_g/1000} \text{ angular mils}$$

Launcher cutoff angle is calculated as prescribed in FM 44–95. It is used as an argument in computer input data nomogram (fig. 123).

f. The additional distance which must be considered in calculating the actual firing range to prevent the missile from impacting short of the target due to gravity effects is called gravity correction. This quantity is utilized as prescribed in FM 44–95.

g. R_g (true ground distance TTR-to-target) is used as an argument in altitude correction nomogram (fig. 124). It is calculated and further utilized as prescribed in FM 44–95.

h. The additional distance which must be considered in calculating the actual firing range due to the difference between map derived range and the actual TTR-to-target range at different altitudes is called altitude correction. This quantity is utilized as prescribed in FM 44–95.

i. Minimum guidance cutoff set (par. 154) is utilized as prescribed in FM 44–95.

j. Actual firing range incorporating gravity and altitude corrections is calculated as prescribed in FM 44–95 and is utilized as prescribed in paragraph 150*g*.

k. Altitude of burst correction (par. 155) is added algebraically to the equivalent altitude of burst in feet for determination of BARO FUZE SET.

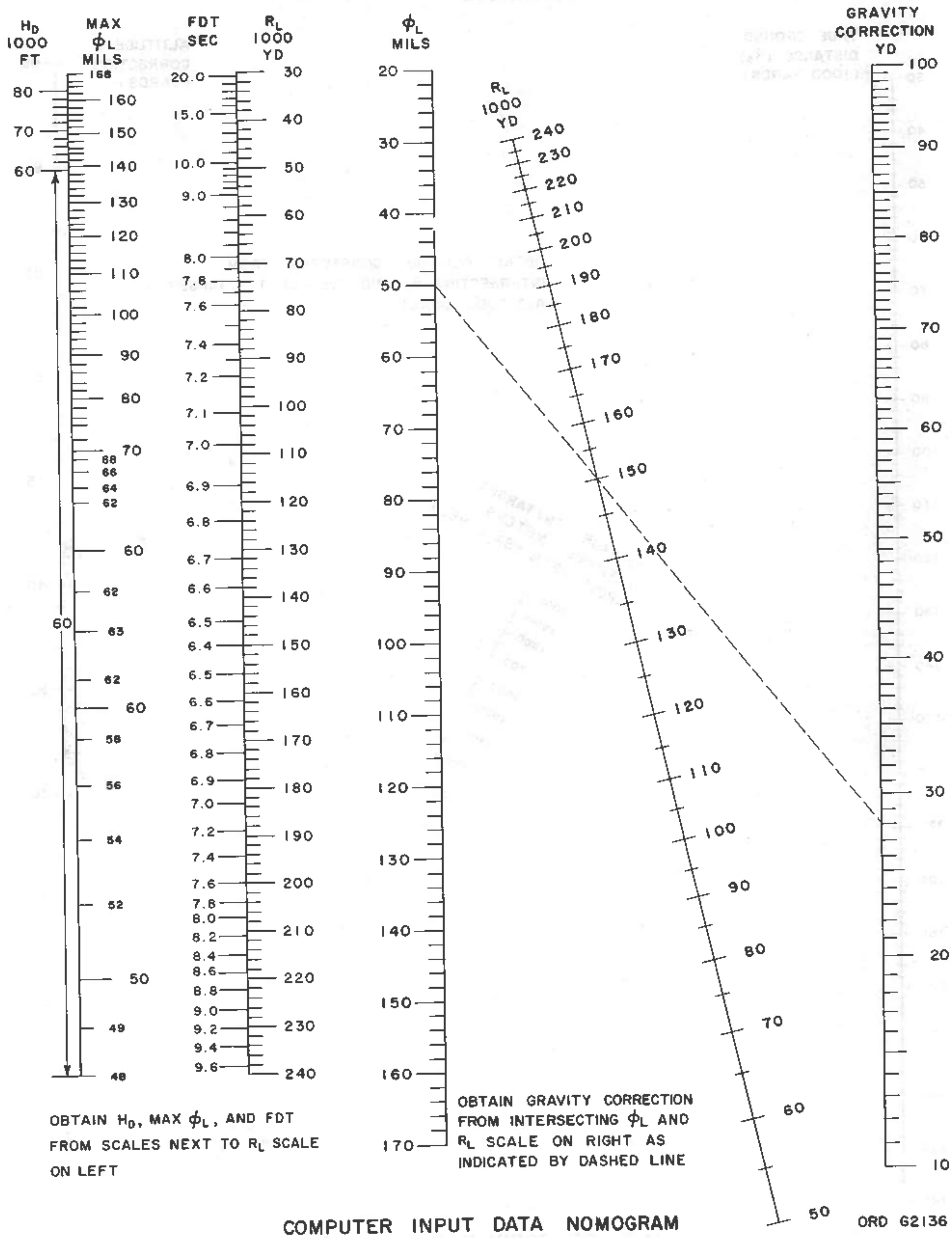


Figure 123 (U). Computer input data nomogram (U).

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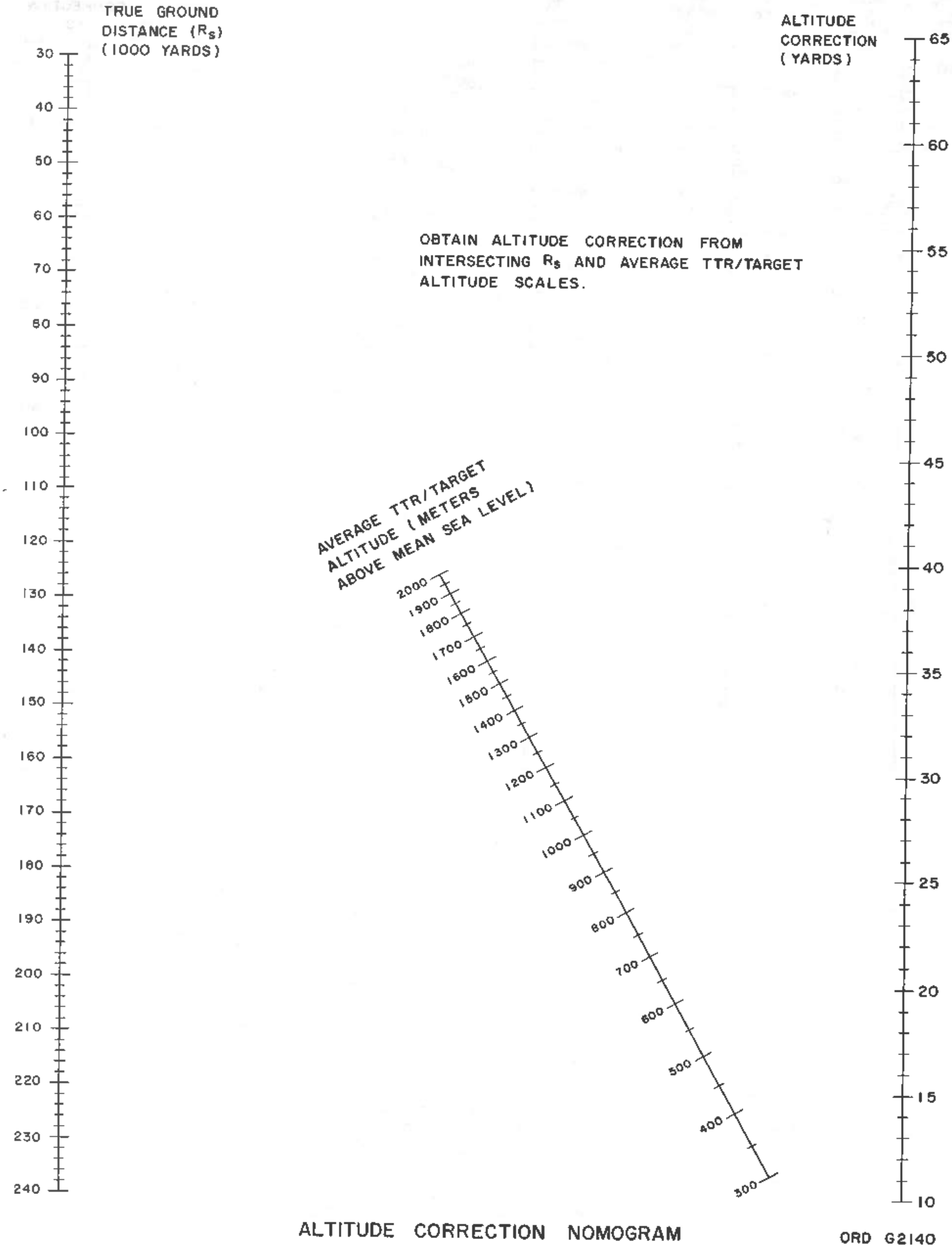

Figure 124 (U). Altitude correction nomogram (U).

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Section III (U). OPERATION UNDER UNUSUAL CLIMATIC CONDITIONS

156.1 (U). General

Operation of the radar and computing equipment may be difficult in regions where extreme cold, extreme heat, humidity and moisture, sand conditions, or high winds prevail. Procedures for minimizing the effects of these unusual climatic conditions are discussed in paragraphs 157 through 161.

157 (U). Operation in Extreme Cold

Subzero temperatures to −40° F. (−4° C.) and climatic conditions associated with cold weather affect operation of the equipment. Instructions and precautions for operation under such adverse conditions are given in *a* through *d* below.

a. Use the personnel heaters to keep the equipment as warm and dry as possible.

b. Keep the equipment energized to "low voltage" to maintain the minimum exhaust temperature.

c. Cover all exterior openings which are not in use to help prevent excessive heat loss.

d. Place rubber-covered cables carefully and, if possible, do not bend or move them. If the cables must be bent or moved, warm them beforehand.

158 (U). Operation in Extreme Heat

When operating the equipment in continued high temperatures up to +125° F. (+51° C.) it is essential that the ventilating systems function properly. Instructions for proper care are given in *a* and *b* below.

a. Personnel Ventilation. Inspect the centrifugal fan in the personnel heater cabinet for proper operation. Check the air port and duct for free passage of air. Test the centrifugal fan intake and exhaust dampers for ease of operation.

b. Equipment Cooling. Check the operation of the equipment cooling fan in the equipment cooling cabinet, equipment cooling blowers B1 and B2 in the target radar control console, and equipment cooling blowers B3 and B4 in the radar set group. Make certain that the intake filter is clean. Test the operation of the shutter and damper lever.

159 (U). Operation Under Extreme Dust Conditions

Operation of the equipment under extreme dust and sand conditions necessitates special care, since sand is an abrasive that causes rapid wear of equipment and dust causes clogging and shorting of equipment, rendering it inoperative. Instructions and precautions for operation under such adverse conditions are listed in *a* through *c* below.

a. Inspect ventilating filters frequently. Clean or replace, as necessary, to insure proper functioning of the ventilating systems.

b. Use protective covers wherever practical.

c. Check lubrication of the equipment.

160 (U). Operation in Areas of High Humidity

Operation under conditions of high humidity presents problems of oxidation and corrosion, condensation, mildew, and fungus growth. Sufficient heat may be normally developed and proper ventilation maintained during operation to eliminate the problems associated with high humidity. However, during nonoperational periods, high humidity may cause problems which could render the equipment inoperative. High humidity problems may be reduced by following the procedures given in *a* through *c* below.

Caution: **Avoid overheating the equipment since excessive temperatures may damage it.**

a. Operate the personnel heaters continuously and keep the trailer doors closed.

b. Check that all cable fittings are tight to prevent moisture from entering the connectors. A cable end should never be left exposed without tightly securing the cable cap in place.

c. Inspect the equipment periodically for corrosion and chipped or cracked paint.

161 (U). Operation During High Winds

High winds are usually accompanied by dust, sand, rain, or snow. The procedures given in paragraphs 159 and 160 are to be followed, where applicable, as well as the procedures

listed in *a* through *c* below. Additional instructions are contained in TM 9-1430-251-10.

a. Tie down the LOPAR antenna-receiver-transmitter group (fig. 36), the target track antenna-receiver-transmitter group, the target ranging antenna-receiver-transmitter group (fig. 45), and the missile track antenna-receiver-transmitter group.

b. Inflate the track antenna radomes of the missile track, target track, and target range antenna-receiver-transmitter groups. Systems can operate in surface wind speeds of 60 miles per hour with gusts to 75 miles per hour.

c. Emplace additional sandbags in accordance with procedures described in TM 9-1430-251-10.

Section III.1 (U). OPERATION UNDER ELECTRONIC INTERFERENCE CONDITIONS

Operation of the radar equipment in regions where interference from channel 2 television or microwave transmission prevails is discussed in paragraphs 161.1 and 161.2. The sites listed below must be inspected to insure that the special purpose kits have been installed prior to operation of the equipment.

161.1 (U). Special Purpose Kit to Eliminate TV Interference

Sites B-36, C-03, C-41, HA-08, PI-71, PR-99, SF-31, SF-51, and NY-90 require special purpose kits to eliminate television interference. The local support shop must be contacted to install the special purpose kit on new or replacement equipment prior to operation.

161.2 (U). Special Purpose Kits to Eliminate Microwave Interference

Sites B-36, C-32, C-41, C-46, C-47, C-49, C-61, C-75, C-93, CL-02, LA-29, LA-80, M-20, M-02, MS-40, SF-31, SL-40, SF-51, SF-87, SF-88, SF-93, T-86, TU-79, and DF-20 require special purpose kits to eliminate interference from the Bell System TD-2 Communications System. The local support shop must be contacted to remove the special purpose kit prior to turn-over for depot overhaul. Retain the special purpose kit on-site to install on new or replacement equipment prior to operation.

Section IV (U). OPERATION DURING LOSS OF INTERAREA CABLES

162 (U). General

When the interarea cables between the launching area and the RCDC are severed or damaged, gyro preset information (A_G), missile designation information, the fire command, and other tactical information must be transmitted by emergency procedures. The operation of the selected acquisition radar system, computer system, and the target tracking and ranging radar systems is the same as operation under usual conditions, discussed in paragraphs 149 and 150. Certain controls on the battery control console and the missile radar control console are operated differently. The operational sequence of these controls is given in paragraph 163.

163 (U). Emergency Procedures During Loss of Interarea Cables

a. The LOCAL DESIGNATE switch on the missile track indicator (11, fig. 30) of the missile radar control console is placed in the up position.

b. Information as to the section and launcher that contain the designated missile is obtained from the launching area by voice communications.

c. The SECTION switch and the LAUNCHER switch on the missile track indicator (11, fig. 30) that correspond with the section and launcher of the designated missile are depressed.

d. The LAUNCHER ACQUIRE switch on the missile track control drawer (9, fig. 30) is operated to slew the missile tracking radar system to the designated missile.

Section V (U). OPERATION DURING RADAR BOMB SCORING (RBS) MISSIONS

164 (U). General

a. Scope. This section describes the procedures for operating the RCDC in conjunction with Air Force equipment during RBS missions. The operational sequence given in paragraph 165 is not to be considered mandatory. These procedures are given only to familiarize operating personnel with the operation of the RCDC when used for radar bomb scoring. During an actual mission, the procedures given in the applicable SOP should be followed.

b. Operational Responsibility. Normally, responsibility for operating the equipment used in RBS missions is divided. Army personnel are responsible for operating RCDC equipment which includes the HIPAR/AAR or the LOPAR system, the TTR, and the computer. Air Force personnel are responsible for operating the RBS control unit and evaluating the recorded data on the mission.

c. Pre-operational Requirements. Before operation of the equipment, the Air Force RBS control unit and the RBS scale factor box, which are portable units, must be properly installed in the director station. In addition, the required daily, weekly, and monthly operational checks must be performed as specified in TM 9-1430-255-12/1, TM 9-1430-251-12/1, TM 9-1430-250-12/6, and TM 9-1430-256-12/1 and the equipment must be trouble free and energized to the "operate" condition as described in paragraphs 142 through 147. Army operating personnel must be familiar with the controls, indicators, and indicator presentations described in chapters 5 and 7.

165 (U). Radar Bomb Scoring Mission

a. RBS Exercise. The RBS exercises are conducted to evaluate the proficiency of Air Force bomber crews engaged in simulated bombing missions. The bomber participating in the exercise is assigned a terrestrial target and initiates a simulated attack on the target. During the attack, the Improved NIKE-HERCULES System accurately tracks the bomber and records its course, speed, and bomb release time with the aid of portable Air Force equipment. When the bomber is in range of the LOPAR or the HIPAR/AAR system, the bomber is acquired and tracked by the selected acquisition radar. After the bomber has been tracked by the acquisition radar, it is designated as a target to the TTR, and bomber position information is transmitted to the TTR for use in acquiring the bomber. When the bomber has been acquired and tracked by the TTR, continuous position information is sent to the computer. The computer supplies bomber azimuth and range information to the horizontal plotting board and bomber altitude information to the RBS box. When the bomber starts its bomb run on the assigned target, a continuous tone signal is transmitted from the bomber to the Army Air Defense Command Post (AADCP) by UHF radio. The AADCP then transmits the tone signal to the director station where it is connected to tone sensitive circuits in the RBS control unit. When the tone signal is received at the RBS control unit, the right horizontal plotting board pen begins to plot the azimuth and range of the bomber. Special timing marks which are generated in the RBS control unit are recorded on the horizontal plotting board trace. When the bomber drops the simulated bomb, the continuous tone signal is momentarily interrupted causing the plotting board pen to lift. Lifting of the pen results in a break in the plotting board trace. This break indicates the exact point in azimuth, range, and time where the simulated bomb was dropped. Simultaneously, the altitude of the bomber at this point is determined from indicators on the RBS control unit. From the bomber azimuth range, and speed data recorded on the horizontal plotting board and the bomber altitude determined from the indicators on the RBS control unit, the trajectory of the simulated bomb can be calculated and the theoretical point of impact determined. This point of impact is compared with the known position of the assigned target and the miss-distance is calculated. The miss-distance is then used by the Air Force personnel to rate the proficiency of the bomber crew.

b. Equipment Conditioning. After an RBS mission has been assigned to Improved NIKE-HERCULES System, the procedures given in (1) through (3) below are followed to prepare the computer and horizontal plotting board for action.

Note. The conditioning of Air Force equipment (RBS scale factor box and RBS control unit) is not covered in this manual as the operation of this equipment is normally Air Force responsibility.

(1) The COMPUTER CONDITION switch on the computer control-panel is set to TRACKING. When the switch is in this position, the computer is conditioned to operate with Air Force equipment on an RBS mission.

(2) The plotting board condition switch is set to OPERATE. Setting the switch in this position conditions the right side of the horizontal plotting board for target plotting and illuminates the right TARGET indicator light. It also enables the right plotting board pen to follow the azimuth and range of the tracked bomber without recording, and enables the tone signal transmitted from the bomber to control the plotting board pen elevation.

(3) If the right side of the horizontal plotting board is not conditioned for target plotting when the plotting board condition switch is set to OPERATE, the procedures given in (*a*) through (*c*) below are followed.

(*a*) The COMPUTER CONDITION switch on the computer control-panel is set to PRE LAUNCH & INITIAL TURN.

(*b*) The PEN INTERCHANGE switch on the tactical control-indicator is operated.

(c) The COMPUTER CONDITION switch is set to TRACKING.

c. Acquisition Radar Selection. Three acquisition radar systems, LOPAR, HIPAR, and AAR are available for use with the Improved NIKE-HERCULES systems on RBS missions. The same presentation system and target acquisition controls are used for all radar systems. The choice of acquisition radar systems for a given bomb scoring mission is determined by bomber and topographical characteristics. The radar system is selected by operating the RADAR SELECT switch on the IFF control-indicator to LOPAR or HIPAR/AAR. Operation of the switch connects the selected radar to the acquisition presentation system.

d. Target Acquisition. Normally, the acquisition radar target (bomber) in an RBS mission is identified and located on the PPI by bomber position information supplied to the Improved NIKE-HERCULES system by the AADCP. The procedures for acquiring and tracking a bomber are the same when using either the LOPAR or HIPAR/AAR system. These procedures are given in paragraph 149*h*.

e. Target Designation. After the target (bomber) has been acquired and tracked by the acquisition radar, the target is designated to the TTR. Target designation is accomplished by depressing the DESIGNATE—ABANDON switch on the target designate control-indicator. These procedures are given in paragraph 149*i*.

f. Target Acquisition by TTR. The procedures for acquiring a target (bomber) in an RBS mission are the same as for acquiring a target in a surface-to-air mission. These procedures are given in paragraph 149*j*.

f.1. Target Tracked. During an RBS mission, NORMAL—RBS TEST switch S1 on the FUIF fixed attenuator is set to the RBS TEST position, providing a target tracked indication to the AADCP.

g. Bombing Run and Scoring. During the bombing run and scoring mission, Army personnel monitor their assigned equipment and track the bomber with the TTR. Air Force personnel operate the RBS equipment and analyze the recorded data on the mission.

h. Post Mission. After the RBS mission has been completed, the Improved NIKE-HERCULES system is prepared for the next mission by following the procedures in (1) through (5) below.

(1) The DESIGNATE—ABANDON switch is operated to ABANDON. The events that occur are the same as given in paragraph 152*p*(5).

(2) The plotting board condition switch is set to STANDBY.

(3) The COMPUTER CONDITION switch on the computer control-panel is set to STANDBY.

(4) Disconnection of the RBS control unit and RBS scale factor box from the battery control console and computer is verified.

Note. The normal 10-second timing marks used with the Improved NIKE-HERCULES System will not be applied to the plotting boards until the RBS control unit has been disconnected.

(5) When the procedures described in (1) through (4) above have been accomplished, the Improved NIKE-HERCULES system is ready for another mission.

Section VI (U). DEENERGIZING THE EQUIPMENT

166 (U). Deenergizing the Missile Tracking Radar System

To place the MTR system in the "shutdown" condition, perform the steps in table 87 in the sequence given.

165 (U). Radar Bomb Scoring Mission

a. RBS Exercise. The RBS exercises are conducted to evaluate the proficiency of Air Force bomber crews engaged in simulated bombing missions. The bomber participating in the exercise is assigned a terrestrial target and initiates a simulated attack on the target. During the attack, the Improved NIKE-HERCULES System accurately tracks the bomber and records its course, speed, and bomb release time with the aid of portable Air Force equipment. When the bomber is in range of the LOPAR or the HIPAR/AAR system, the bomber is acquired and tracked by the selected acquisition radar. After the bomber has been tracked by the acquisition radar, it is designated as a target to the TTR, and bomber position information is transmitted to the TTR for use in acquiring the bomber. When the bomber has been acquired and tracked by the TTR, continuous position information is sent to the computer. The computer supplies bomber azimuth and range information to the horizontal plotting board and bomber altitude information to the RBS box. When the bomber starts its bomb run on the assigned target, a continuous tone signal is transmitted from the bomber to the Army Air Defense Command Post (AADCP) by UHF radio. The AADCP then transmits the tone signal to the director station where it is connected to tone sensitive circuits in the RBS control unit. When the tone signal is received at the RBS control unit, the right horizontal plotting board pen begins to plot the azimuth and range of the bomber. Special timing marks which are generated in the RBS control unit are recorded on the horizontal plotting board trace. When the bomber drops the simulated bomb, the continuous tone signal is momentarily interrupted causing the plotting board pen to lift. Lifting of the pen results in a break in the plotting board trace. This break indicates the exact point in azimuth, range, and time where the simulated bomb was dropped. Simultaneously, the altitude of the bomber at this point is determined from indicators on the RBS control unit. From the bomber azimuth range, and speed data recorded on the horizontal plotting board and the bomber altitude determined from the indicators on the RBS control unit, the trajectory of the simulated bomb can be calculated and the theoretical point of impact determined. This point of impact is compared with the known position of the assigned target and the miss-distance is calculated. The miss-distance is then used by the Air Force personnel to rate the proficiency of the bomber crew.

b. Equipment Conditioning. After an RBS mission has been assigned to Improved NIKE-HERCULES System, the procedures given in (1) through (3) below are followed to prepare the computer and horizontal plotting board for action.

Note. The conditioning of Air Force equipment (RBS scale factor box and RBS control unit) is not covered in this manual as the operation of this equipment is normally Air Force responsibility.

(1) The COMPUTER CONDITION switch on the computer control-panel is set to TRACKING. When the switch is in this position, the computer is conditioned to operate with Air Force equipment on an RBS mission.

(2) The plotting board condition switch is set to OPERATE. Setting the switch in this position conditions the right side of the horizontal plotting board for target plotting and illuminates the right TARGET indicator light. It also enables the right plotting board pen to follow the azimuth and range of the tracked bomber without recording, and enables the tone signal transmitted from the bomber to control the plotting board pen elevation.

(3) If the right side of the horizontal plotting board is not conditioned for target plotting when the plotting board condition switch is set to OPERATE, the procedures given in (*a*) through (*c*) below are followed.

(*a*) The COMPUTER CONDITION switch on the computer control-panel is set to PRE LAUNCH & INITIAL TURN.

(*b*) The PEN INTERCHANGE switch on the tactical control-indicator is operated.

(c) The COMPUTER CONDITION switch is set to TRACKING.

c. Acquisition Radar Selection. Three acquisition radar systems, LOPAR, HIPAR, and AAR are available for use with the Improved NIKE-HERCULES Systems on RBS missions. The same presentation system and target acquisition controls are used for all radar systems. The choice of acquisition radar systems for a given bomb scoring mission is determined by bomber and topographical characteristics. The radar system is selected by operating the RADAR SELECT switch on the IFF control-indicator to LOPAR or HIPAR/AAR. Operation of the switch connects the selected radar to the acquisition presentation system.

d. Target Acquisition. Normally, the acquisition radar target (bomber) in an RBS mission is identified and located on the PPI by bomber position information supplied to the Improved NIKE-HERCULES System by the AADCP. The procedures for acquiring and tracking a bomber are the same when using either the LOPAR or HIPAR/AAR system. These procedures are given in paragraph 149*h*.

e. Target Designation. After the target (bomber) has been acquired and tracked by the acquisition radar, the target is designated to the TTR. Target designation is accomplished by depressing the DESIGNATE—ABANDON switch on the target designate control-indicator. These procedures are given in paragraph 149*i*.

f. Target Acquisition by TTR. The procedures for acquiring a target (bomber) in an RBS mission are the same as for acquiring a target in a surface-to-air mission. These procedures are given in paragraph 149*j*.

g. Bombing Run and Scoring. During the bombing run and scoring mission, Army personnel monitor their assigned equipment and track the bomber with the TTR. Air Force personnel operate the RBS equipment and analyze the recorded data on the mission.

h. Post Mission. After the RBS mission has been completed, the Improved NIKE-HERCULES System is prepared for the next mission by following the procedures in (1) through (5) below.

(1) The DESIGNATE—ABANDON switch is operated to ABANDON. The events that occur are the same as given in paragraph 152*p*(5).

(2) The plotting board condition switch is set to STANDBY.

(3) The COMPUTER CONDITION switch on the computer control-panel is set to STANDBY.

(4) Disconnection of the RBS control unit and RBS scale factor box from the battery control console and computer is verified.

Note. The normal 10-second timing marks used with the Improved NIKE-HERCULES System will not be applied to the plotting boards until the RBS control unit has been disconnected.

(5) When the procedures described in (1) through (4) above have been accomplished, the Improved NIKE-HERCULES System is ready for another mission.

Section VI (U). DEENERGIZING THE EQUIPMENT

166 (U). Deenergizing the Missile Tracking Radar System

To place the MTR system in the "shutdown" condition, perform the steps in table 87 in the sequence given.

Table 87 (U). Deenergizing—"Operate" to Shutdown" Missile Tracking Radar System (U)

Step	Location	Control	Control setting	Remarks
1	Missile track indicator	LOCAL DESIG-NATE switch	Off (down)	
2	Missile track indicator	MISSILE READY switch	Off (down)	
3	Range indicator	IMAGE SPACING switch	OFF	
4	Range indicator	INTENSITY knob	Fully ccw	
5	Range indicator	SWEEP LENGTH knob	Fully ccw	
6	Missile control-indicator group	TARGET–STAND-BY–MIS-SILE switch	STANDBY	
7	Missile track control drawer	TEST switch	TEST	
8	Missile track control drawer	DISABLE switch	Off (down)	
9	Missile track control drawer	SERVOS switch	NORMAL	
10	Missile track control drawer	RANGE switch	NORMAL	
11	Missile track control power supply	HV SUPPLY knob	START (fully ccw)	
12	Missile track control power supply	HV SUPPLY —OFF switch	Depress	*a.* HV SUPPLY — ON and MISSILE — HIGH VOLTS—ON indicator lights extinguish. *b.* MISSILE — HIGH VOLTS — PREHEAT, MISSILE—HIGH VOLTS—HOT, MISSILE—HIGH VOLTS—READY, and MISSILE—INTLK indicator lights on the radar power control-indicator and the HV SUPPLY—READY indicator light illuminate. *Note.* The MTR is now conditioned in a "low voltage" condition.
13	Missile track control power supply	IND HV switch	OFF	IND HV indicator light extinguishes.
14	Missile track control power supply	AGC switch	AGC	
15	Radar power control-indicator	MISSILE—PLATE VOLTS switch	OFF	*a.* Removes plate voltage from the MTR system. *b.* MISSILE—PLATE VOLTS—READY indicator light illuminates.

Table 87 (U). Deenergizing—"Operate" to "Shutdown" Missile Tracking Radar System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
15				*c.* MISSILE—PLATE VOLTS—ON and MISSILE—HIGH VOLTS—READY indicator lights and HV SUPPLY—READY indicator light on the missile track control power supply extinguish.
16	Radar power control-indicator	MISSILE POWER switch	Off (down)	*a.* MISSILE — HIGH VOLTS — PREHEAT, MISSILE—PLATE VOLTS—READY, and MISSILE—HIGH VOLTS—HOT indicator lights extinguish. *b.* MISSILE—INTLK indicator light remains illuminated.
17	Radar power control-indicator	MAIN POWER switch	Off (down) *Note.* This switch must be left in the ON position if the TTR or TRR system is energized and is to remain energized.	***Warning:*** Voltages DANGEROUS TO LIFE are present in the external power cables when the engine-driven generator is operating. Make certain that the engine-driven generator is turned off before disconnecting any external power cables. *a.* Removes all power to the radar equipment in the trailer mounted tracking station. *b.* MISSILE—INTLK indicator light extinguishes.

167 (U). Deenergizing the Target Ranging Radar System

To place the TRR system in the "shutdown" condition, perform the steps in table 88 in the sequence given.

Table 88 (U). Deenergizing—"Operate" to "Shutdown"—Target Ranging Radar System (U)

Step	Location	Control	Control setting	Remarks
1	Counter-measures control-indicator	PAN FOCUS knob	Fully ccw	
2	Counter-measures control-indicator	PAN INTENSITY knob	Fully ccw	
3	Counter-measures control-indicator	TRR INTENSITY knob	Fully ccw	
4	Counter-measures control-indicator	TRR FOCUS knob	Fully ccw	
5	Counter-measures control-indicator	MOD A—HV knob	Fully ccw	

Table 88 (U). Deenergizing—"Operate" to "Shutdown"—Target Ranging Radar System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
6	Counter-measures control-indicator	MAG A—HV OFF switch	Depress	The indicator lights in *a* and *b* below illuminate. *a.* MAG A—HV ON *b.* HIGH VOLTAGE—ON A and HIGH VOLTAGE—READY A on the range radar power control-indicator.
7	Counter-measures control-indicator	MOD B—HV knob	Fully ccw	
8	Counter-measures control-indicator	MAG B—HV OFF switch	Depress	*a.* MAG B—HV ON and HIGH VOLTAGE—ON B indicator lights extinguish, and MAG B—READY indicator light illuminates. *b.* The indicator lights in (1) through (3) below on the range radar power control-indicator illuminate. (1) HIGH VOLTAGE—PREHEAT (2) HIGH VOLTAGE—HOT (3) HIGH VOLTAGE—READY B *Note.* The TRR is now in a "low voltage" condition.
9	Range radar power control-indicator	PLATE VOLTAGE switch	OFF	*a.* PLATE VOLTAGE—READY and PLATE VOLTAGE—INTLK indicator lights illuminate. *b.* The indicator lights in (1) through (5) below extinguish. (1) PLATE VOLTAGE—ON (2) HIGH VOLTAGE—READY A (3) HIGH VOLTAGE—READY B (4) MAG A—READY on the countermeasures control-indicator. (5) MAG B—READY on the countermeasures control-indicator.
10	Range radar power control-indicator	TRR POWER switch	OFF	*a.* The indicator lights in (1) through (3) below extinguish. (1) HIGH VOLTAGE—PREHEAT (2) PLATE VOLTAGE—READY (3) HIGH VOLTAGE—HOT *b.* PLATE VOLTAGE—INTLK indicator light remains illuminated.
11	Radar power control-indicator	MAIN POWER switch	Off (down) *Note.* This switch must be left in the ON position if the TTR or MTR system is energized and is to remain energized.	*a.* Removes all power to the radar equipment in the trailer mounted tracking station. *b.* PLATE VOLTAGE—INTLK indicator light on the range radar power control-indicator extinguishes.

168 (U). Deenergizing the Target Tracking Radar System

To place the TTR system in the "shutdown" condition, perform the steps in table 89 in the sequence given.

Table 89 (U). Deenergizing—"Operate" to "Shutdown"—Target Tracking Radar System (U)

Step	Location	Control	Control setting	Remarks
1	Elevation indicator	INTENSITY knob	Fully ccw	
2	Elevation indicator	SWEEP LENGTH knob	Fully ccw	
3	Azimuth indicator	INTENSITY knob	Fully ccw	
4	Azimuth indicator	SWEEP LENGTH knob	Fully ccw	
5	Target range indicator	INTENSITY knob	Fully ccw	
6	Target range indicator	SWEEP LENGTH knob	Fully ccw	
7	B scope indicator	INTENSITY knob	Fully ccw	
8	B scope indicator	GAIN knob	Fully ccw	
9	B scope indicator	LIGHTS knob	Fully ccw	
10	Target antenna control group	Azimuth MAN—AID —AUTO switch	MAN	
11	Target antenna control group	SERVOS switch	Off (center)	
12	Target antenna control group	TEST switch	TEST	
13	Target antenna control group	Range MAN —ACQUIRE AID— TRACK AID— AUTO switch	MAN	
14	Target antenna control group	RANGE switch	NORMAL	
15	Target antenna control group	RANGE TRACK switch	TTR	
16	Target antenna control group	Elevation MAN—AID —AUTO switch	MAN	
17	Target track control-power supply	HV SUPPLY knob	START (fully ccw)	
18	Target track control-power supply	HV SUPPLY —OFF switch	Depress	*a.* HV SUPPLY—ON indicator light on the target track control-power supply and TARGET—HIGH VOLTS—ON indicator light on the radar power control-indicator extinguish. *b.* The indicator lights in (1) through (5) below illuminate.

Table 89 (U). Deenergizing—"Operate" to "Shutdown"—Target Tracking Radar System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
18				(1) TARGET—HIGH VOLTS—PREHEAT on the radar power control-indicator. (2) TARGET—HIGH VOLTS—HOT (3) TARGET—HIGH VOLTS—READY (4) TARGET—INTLK (5) HV SUPPLY—READY on the target track control-power supply. *Note.* The TTR is now in the "low voltage" condition.
19	Target track control-power supply	AGC switch	AGC	
20	Target track control-power supply	IND HV switch	OFF	IND HV indicator light extinguishes.
21	Target track control-power supply	PULSE switch	LONG	
22	Target track control-power supply	IND switch	A	
23	Radar power control-indicator	TARGET—PLATE VOLTS switch	OFF	*a.* TARGET—PLATE VOLTS—READY indicator light illuminates. *b.* The indicator lights in (1) through (3) below extinguish. (1) TARGET—PLATE VOLTS—ON (2) TARGET—HIGH VOLTS—READY (3) HV SUPPLY—READY on the target track control-power supply.
24	Radar power control-indicator	TARGET POWER switch	Off (down)	*a.* The indicator lights in (1) through (3) below extinguish. (1) TARGET—HIGH VOLTS—PREHEAT (2) TARGET—PLATE VOLTS—READY (3) TARGET—HIGH VOLTS—HOT *b.* TARGET—INTLK indicator light remains illuminated. ***Warning:*** Voltages DANGEROUS TO LIFE are present in the external power cables when the engine-driven generator is operating. Make certain that the engine-driven generator is turned off before disconnecting any external power cables.
25	Radar power control-indicator	MAIN POWER switch	Off (down) *Note.* This switch must be left in the ON position if the MTR or TRR system is energized and is to remain energized.	*a.* Removes all power to the radar equipment in the trailer mounted tracking station. *b.* TARGET—INTLK indicator light extinguishes.

169 (U). Deenergizing the Multichannel Data Recorder

The multichannel data recorder is deenergized by one of three methods, as described in *a* through *c* below, depending upon the method used in energizing the recorder.

a. Deenergizing Procedure when Multichannel Data Recorder has been Energized by Sig-

nal-Recording Method. The multichannel data recorder automatically ceases operation when the alert status switch on the tactical control-indicator is set to any position other than RED or the designated target is abandoned. When the MAIN POWER switch on the acquisition power control panel is set to the off (down) position, the multichannel data recorder is completely deenergized.

Note. Do not turn off main power if the TRR, TTR, or MTR systems, the LOPAR system, or the computer system is energized and is to remain energized.

b. Deenergizing Procedure when Multichannel Data Recorder has been Energized by Alternate Signal-Recording Method. The multichannel data recorder is deenergized when the OPERATE–TEST switch on the multichannel data recorder is set to OPERATE, provided the alert status switch on the tactical control-indicator is set to any position other than RED, a target has not been designated, or the designated target is abandoned. When the MAIN POWER switch on the acquisition power control panel is set to the off (down) position, the multichannel data recorder is completely deenergized.

Note. Do not turn off main power if the TRR, TTR, or MTR systems, the LOPAR system, or the computer system is energized and is to remain energized.

c. Deenergizing Procedure when Multichannel Data Recorder has been Energized by Test Method.

(1) To deenergize the multichannel data recorder, perform the procedures in (*a*) through (*c*) below in the sequence given.

(*a*) Turn shutter knob fully clockwise.

(*b*) Set RECORD–VIEW switch to RECORD.

(*c*) Set OPERATE–TEST switch to OPERATE.

Note. Do not turn off main power if the TRR, TTR, or MTR systems, the LOPAR system, or the computer system is energized and is to remain energized.

(2) To completely deenergize the multichannel data recorder, set MAIN POWER switch on acquisition power control panel to the off (down) position.

170 (U). Deenergizing the Computer System

To place the computer system in the "shutdown" condition, perform *a* through *f* below in the sequence given.

a. Set the plotting board condition switch on the tactical control-indicator to STANDBY. The STANDBY indicator light illuminates (green).

b. Set COMPUTER CONDITION switch on the computer control-panel to STANDBY.

Note. The computer system is now in a "standby" condition.

c. Set SERVO DC switch on the computer power control panel to the off (down) position.

d. Set PLATE VOLTS switch on the computer power control panel to the off (down) position.

e. Set COMPUTER POWER switch on the computer power control panel to OFF.

Note. Do not turn off main power if the TRR, TTR, or MTR systems, the LOPAR system, or the multichannel data recorder is energized and is to remain energized.

***Warning:* Voltages DANGEROUS TO LIFE are present in these cables when main power source is energized. Make certain that main power source is deenergized before attempting to disconnect any external cables.**

f. Set MAIN POWER switch on the acquisition power control panel to the off (down) position.

171 (U). Deenergizing the LOPAR System

To place the LOPAR system in the "shutdown" condition, perform steps in table 90 in the sequence given.

Table 90 (U). Deenergizing—"Operate" to "Shutdown"—LOPAR System (U)

Step	Location	Control	Control setting	Remarks
1	PPI	VIDEO GAIN knob	Fully ccw	
2	PPI	SYMBOL INTENSITY knob	Fully ccw	
3	LOPAR control-indicator	GAIN—AGC knob	Fully ccw	
4	LOPAR auxiliary control-indicator	HV SUPPLY knob	START position	
5	LOPAR auxiliary control-indicator	H.V. SUPPLY OFF switch	Depress	*a.* H.V. SUPPLY ON indicator light extinguishes. *b.* Removes high voltage from the LOPAR system. *c.* HIGH VOLTS—ON indicator light on the acquisition power control panel extinguishes, and the HIGH VOLTS—PREHEAT, HIGH VOLTS—HOT, HIGH VOLTS—READY, and INTLK indicator lights on the acquisition power control panel illuminate. *Note.* The LOPAR system is now in a "low voltage" condition.
6	LOPAR auxiliary control-indicator	IND. H.V. switch	Off (down)	IND. H.V. ON indicator light extinguishes.
7	LOPAR control-indicator	ANT RPM switch	OFF	
8	Acquisition power control panel	BARBETTE DC switch	OFF	*a.* Removes dc voltage from the barbett of the LOPAR system. *b.* The indicator lights listed in (1) through (4) below, extinguish. (1) BARBETTE DC (2) HIGH VOLTS—READY (3) READY on the LOPAR auxiliary control-indicator (4) AFC on the LOPAR control-indicator
9	Acquisition power control panel	PLATE VOLTS switch	OFF	*a.* Removes plate voltage from presentation circuits and units in the director station group. *b.* PLATE VOLTS—ON indicator light extinguishes. *c.* PLATE VOLTS—READY indicator light illuminates.
10	Acquisition power control panel	BARBETTE AC POWER switch	Off (down)	*a.* Removes ac voltage from the barbette of the LOPAR system. *b.* The indicator lights listed in (1) through (3) below extinguish. (1) PLATE VOLTS—READY (2) HIGH VOLTS—PREHEAT (3) HIGH VOLTS—HOT
11	Acquisition power control panel	PRESENTATION POWER switch	Off (down)	*a.* Removes ac power from all presentations in director station trailer. Extinguishes INTLK indicator light. *b.* Removes filament voltage of the presentation systems in the battery control console and the director station group.

Table 90 (U). Deenergizing—"Operate" to "Shutdown"—LOPAR System—Continued *(U)*

Step	Location	Control	Control setting	Remarks
12	Acquisition power control panel	MAIN POWER switch	Off (down)	*Note.* This switch must be left in the ON position if the computer, TRR, TTR, or MTR systems are energized and are to remain energized. ***Warning:*** **Voltages DANGEROUS TO LIFE are present in the external power cables of the main power source. Make certain that main power source is deenergized before disconnecting any external power cables.**

CHAPTER 9 (U)

REPAIR PARTS, ORGANIZATIONAL TOOLS, AND TEST EQUIPMENT

Section I (U). REPAIR PARTS AND TOOLS

172 (U). Repair Parts and Common Tools

a. Repair parts, tools, and equipment are issued to the using organization for operation and maintenance of the RCDC. The repair parts, tools, and equipment must not be used for purposes other than those prescribed in tables 91 through 93, and, after use, must be cleaned and returned to their proper storage locations.

b. Repair parts are supplied to the using organization as replacements for those parts most likely to become worn, broken, or otherwise unserviceable. Corrective maintenance procedures are given in chapter 11. Repair parts, tools, and equipment provided for organizational maintenance are listed in the technical manuals below.

(1) Trailer mounted director station AN/MSA-19A, AN/MSQ-52: TM 9-1430-250-12P/9/2.

(2) Trailer mounted tracking station AN/MPA-5A: TM 9-1430-250-12P/10/2.

(3) RCDC, antenna-receiver-transmitter group, missile tracking, trailer mounted, OA-1340/MPA: TM 9-1430-250-12P/3/2.

(4) RCDC, antenna-receiver-transmitter group, target tracking, trailer mounted, OA-1488A/MPA: TM 9-1430-250-12P/7/2.

(5) RCDC, antenna-receiver-transmitter group, target ranging, trailer mounted, OA-3390/MPA: TM 9-1430-250-12P/8/2.

(6) RCDC, antenna-receiver-transmitter group, acquisition OA-1601/T, OA-1596/T and A frame, vehicle mounting: TM 9-1430-250-12P/2/2.

(7) Antenna mast group, collimation OA-1600A/T: TM 9-1430-250-12P/6.

(8) RCDC, test set, radar AN/TSM-47: TM 9-1430-250-12P/13/2.

(9) RCDC, guided missile, trailer mounted TM 9-1430-253-12P/1/2.

173 (U). Special Tools and Equipment

a. Special tools and equipment peculiar to the maintenance requirements of the RCDC are described in this paragraph. Included in the category of special tools and equipment are tools mounted in cabinets, consoles, and enclosures adjacent to the equipment on which they are to be used.

b. Table 91 lists all special tools and equipment, with the exception of tools and equipment mounted in cabinets consoles, and enclosures, which are listed in table 92. Tables 91 and 92 list the special tools and equipment in alphabetical order. The Use column briefly describes the use of the item. The Location column in table 92 identifies the area in which the item may be found in the cabinets, consoles, and enclosures. Common tools and equipment having general application are not included in these tables unless they are part of a tool kit which also includes special tools and equipment. Use the technical manuals listed in paragraph 172*b*, for requisitioning replacement items.

Table 91 (U). Special Tools and Equipment (U)

Item	Use
ATTENUATOR, VARIABLE	Alining electrical and mechanical axes of track antenna reflector assembly.
CABLE ASSEMBLY, RADIO FREQUENCY (2)	During checks, adjustments, and troubleshooting; connects to test adapter.

Table 91 (U). Special Tools and Equipment—Continued *(U)*

Item	Use
CABLE ASSEMBLY, RADIO FREQUENCY TRANSMISSION	During phasing of missile track and target track antenna-receiver-transmitters; provides 90-degree phasing with 6-db attenuation.
CASE, ANTENNA	Storing auxiliary antenna and level subassembly.
Containing:	
ANTENNA, AUXILIARY [1]	Antenna for AJD capabilities.
LEVEL ASSEMBLY [1]	Leveling auxiliary antenna.
CONTROL, LOCAL ANTENNA (2)	Controlling elevation and azimuth of missile track or target track antenna-receiver-transmitters at their emplaced location.
Including:	
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL	Connecting local antenna control group to missile track or target track antenna-receiver-transmitter.
DERRICK: acquisition antenna	Removing and installing acquisition antenna.
Including:	
ROPE, GUIDE (6): derrick, ⅝ dia	Guiding and positioning acquisition antenna.
SUPPORT ASSEMBLY, LOWER	Attaching LOPAR antenna derrick to antenna pedestal leg.
SUPPORT ASSEMBLY, UPPER	Attaching LOPAR antenna derrick to acquisition antenna pedestal.
DISPENSER, OIL: type no. AN/MSG-3	Draining and filling oil-filled variable resistors.
Consisting of:	
ADAPTER, FILTER	During filling of large oil-filled variable resistors; holds fluid filter element; connects to hose assembly 8158092.
ADAPTER, FILTER	During filling of small oil-filled variable resistors; holds fluid filter element; connects to hose assembly 8158092.
BAG	Storing oil dispenser components.
DISPENSER: oil	During filling of oil-filled variable resistors; punctures insulating oil can and provides connections for hose assemblies 8158092 and 8158093.
FILTER ELEMENT: fluid	During filling of oil-filled variable resistors, filters foreign matter from insulating oil.
FITTING: lubrication pressure	During draining and filling of large oil-filled variable resistors; connects filter adapter 8158089 or hose assembly 8158095 to drain-refill valve on oil-filled variable resistor.
HOSE ASSEMBLY	During filling of oil-filled variable resistors; provides path for insulating oil flow between oil dispenser and oil-filled variable resistor.
HOSE ASSEMBLY	During draining and filling of oil-filled variable resistors; provides path for air flow from pump to either oil dispenser or oil-filled variable resistor.
HOSE ASSEMBLY	During draining and filling of oil-filled variable resistors; provides path for insulating oil flow between oil-filled variable resistor and oil dispenser.
PUMP	During draining and filling of oil-filled variable resistors; provides necessary air pressure to force insulating oil into, or out of, oil-filled variable resistor.
FIXTURE, TEST COVER	During power-on checks and adjustments or troubleshooting; provides transparent cover for modulator compartment of missile track or target track antenna-receiver-transmitters to protect personnel.
HARNESS: lifting	Removing and installing acquisition antenna.
Consisting of:	
BLOCK (2): support	Supporting acquisition antenna after antenna has been removed.
CASE	Storing lifting harness and support blocks.
HARNESS: lifting	During removal and installation of acquisition antenna; attaches acquisition antenna derrick to antenna.

[1] Normally installed on acquisition antenna.

Table 91 (U). Special Tools and Equipment—Continued *(U)*

Item	Use
HARNESS: lifting—Continued Consisting of:	
HOOK: hoist	Extending lifting harness to clear auxiliary antenna subassembly.
INSTALLATION KIT, ACQUISITION ANTENNA	Removing and installing acquisition antenna.
KIT: event recorder	Servicing multichannel data recorder.
KIT, STAMPING	Changing or restoring Ordnance numbers on equipment.
LOCK, ANTI-ROTATIONAL	During servicing or maintenance of acquisition antenna or acquisition antenna pedestal; prevents accidental rotation of antenna.
PAN ASSEMBLY: w/drain plug, mtd on legs 27 x 20⅝ x 4¼	Cleaning and charging air conditioning filters.
PEN SERVICING KIT: in cardboard container	Cleaning and servicing horizontal and altitude plotting board recorder pens.
Consisting of:	
BATTERY FILLER, SYRINGE: inkwell	Filling recorder pens.
BRUSH, CLEANING: corr-res-S, wire approx 40 strands, 3 lg	Cleaning recorder pens.
FILLER, PEN: duckbill type	Creating a vacuum in recorder pen to cause ink to flow if pen is clogged.
SET, MISCELLANEOUS EQUIPMENT: grn 1½ oz in a 2 oz bottle	Filling recorder pens; provides container of green ink.
PROTRACTOR, PLOTTING, PLASTIC: 6 dia, grad in angular mils, semicircular	Analyzing horizontal plots after an engagement, and determining exact position of plotting board recorder pens.
SCALE, PLOTTING, ACRYLIC PLASTIC: 15⅛ lg x 2¼ w x 0.125 thk	Analyzing horizontal and altitude plots after an engagement, and determining exact position of plotting board recorder pens.
SET, IFF TEST CABLES	Checking and troubleshooting IFF equipment.
SET, MISCELLANEOUS TEST EQUIPMENT	Monitoring voltages to observe waveforms and general testing.
SET, TEST CORD AND ASSEMBLY	Signal coupling, synchronizing, and general testing.
SET, WRENCH ASSEMBLY, TORQUE (2)	Measuring torque of magnetron tuning drive.
SPOTLIGHT	During collimation at night provides illumination of radar test set antenna assembly-mast group.
TELESCOPE ACCESSORIES, KIT (3)	Checking telescope assembly reticles.
TELESCOPE ASSEMBLY (3): track antenna	Collimating missile track, target track, and target range antenna-receiver-transmitter groups.
TEST SET, ANTENNA	Controlling elevation and azimuth of target range antenna-receiver-transmitter at its emplaced location.
TOOL KIT, BATTERY CONTROL TOOL PACK	Maintaining and adjusting director-computer group.
TOOL KIT, MISSILE ANTENNA	Maintaining and adjusting missile track antenna-receiver-transmitter group.
TOOL KIT, RADAR CONTROL	Maintaining and adjusting tracking station group.
TOOL KIT, TARGET ANTENNA	Maintaining and adjusting target track antenna-receiver-transmitter group.
TOOL SET, MAINTENANCE TOOL PACK NO. 1	Maintaining and adjusting components of the RCDC.
TOOL SET, MAINTENANCE TOOL PACK NO. 2	Maintaining and adjusting components of the RCDC.

Table 92 (U). Cabinet Mounted Tools (U)

Item	Use	Location
ADJUSTER, GALVANOMETER: al knob, S, shk, 1½ dia x 2 lg, knob ¼ dia shk	Positioning galvanometers in multichannel data recorder.	Fuse panel in recorder group.
CABLE ASSEMBLY, RADIO FREQUENCY	Connecting FREQ METER—OUT connector to MEAS PWR connector on frequency and power meter.	Frequency and power meter.
CLIP REMOVER TOOL: S, ni- or zn-pltd, 0.281 dia x 3 lg	Removing galvanometer clips from galvanometer contacts.	Fuse panel in recorder group.
EXTENSION LIGHT (2)	Providing illumination during maintenance, or checks and adjustments of missile track and target track receiver-transmitters.	Cover assembly of the missile track and target track antenna-receiver-transmitters.
EXTRACTOR, LAMP: min lamp type nonmetallic extractor end, metallic hdl	Removing and installing incandescent lamps in multichannel data recorder.	Fuse panel in recorder group.
LEAD, TEST (2)	Shorting high-voltage capacitors to ground in missile track and target track receiver-transmitters.	Rear of the track and target track RF control-power supply groups.
PIN, LOCATING: zeroing for handset and spiral, res, var	Making zero checks and adjustments of variable resistors on altitude plotting board.	Rear wall behind altitude plotting board.
PROBE, TEST	Performing checks, adjustments, and troubleshooting of missile and target radar control consoles.	Rear of right access door in the target radar control console.
SCREWDRIVER, FLAT TIP (2): nonmagnetic	Removing magnetron electron tube from missile track and target track receiver-transmitters.	Lower right side of the missile track and target track antenna-receiver-transmitter.
TOOL, SERVO SETTING	Performing checks and adjustments in computer servo cabinet.	Rear of left access door in servo computer assembly.
WRENCH, ATTACHMENTS	Performing checks and adjustments of synchro transmitter assembly.	Below azimuth dial in acquisition antenna pedestal.
WRENCH, SOCKET-HEAD SCREW: hex, S, cd- or zn-pltd, 1 61/64 lg, for no. 8 set or no. 4 cap screw	Performing corrective maintenance of missile track and target track receiver-transmitters.	Lower right side of the missile track and target track antenna-receiver-transmitters.
WRENCH, SOCKET-HEAD SCREW (2): zn-pltd, 1 13/16 lg, 0.0625 across flats	Performing corrective maintenance of missile track and target track receiver-transmitters and acquisition modulator.	Lower right side of the missile track and target track antenna-receiver-transmitters.
WRENCH, SOCKET-HEAD SCREW: S, cd- or zn-pltd, hex, 0.1250 across flats, L-hdl, 2⅜ for no. ¼ set or no. 8 cap screw	Performing corrective maintenance of missile track and target track receiver-transmitters.	Lower right side of the missile track and target track antenna-receiver-transmitters.
WRENCH, SOCKET-HEAD SCREW	Performing corrective maintenance of acquisition receiver-transmitter.	Front of magnetron in acquisition receiver-transmitter.
WRENCH, SOCKET-HEAD SCREW	Performing corrective maintenance of acquisition modulator.	Left wall beside the modulator tube in acquisition modulator.
WRENCH, T-HANDLE	Removing and installing multichannel data recorder.	Rear of upper right door of the recorder group.
WRENCH, ZERO-SET (2)	Performing checks and adjustments of time-to-intercept computer and A_G, B, and T_D computer.	Left side of the time-to-intercept computer and below the DEAD TIME dial in the servo computer assembly.
WRENCH, ZERO-SET	Performing checks and adjustments of target range amplifier control group.	Below range dial in target range amplifier control group.

Table 92 (U). Cabinet Mounted Tools—Continued *(U)*

Item	Use	Location
WRENCH, ZERO-SET (2)	Performing checks and adjustments of transit time and velocity correction servos.	Left side of the TRANSIT TIME and VELOCITY CORRECTION dials in the servo computer assembly.
WRENCH, ZERO-SETTING (3)	Performing checks and adjustments of climb and turn computer and of azimuth and elevation correction transmitters.	Between the climb and turn computer in the servo computer assembly; and on each azimuth and elevation correction transmitter in the target track and missile track antenna-receiver-transmitter groups.

Section II (U). TEST EQUIPMENT

174 (U). General

A list of the electronic test equipment supplied with the RCDC is contained in ORD 7 SNLY-4, sections 1 through 5 and 9, which should be used for requisitioning replacement items. Table 93 lists each item of test equipment together with the number of the TM that gives operating instructions and use.

Table 93 (U). Test Equipment (U)

Item	TM identifying number	Use
MULTIMETER TS-352A/U	TM 11-5527	Voltage, resistance, and current measurements; general purpose multimeter.
MULTIMETER, ELECTRONIC TYPE: TS-505A/U	TM 11-5511A	Voltage and resistance measurements; general purpose vacuum-tube voltmeter.
OSCILLOSCOPE: AN/USM-32	TM 11-5123	Observing waveforms; general purpose portable test oscilloscope.
TEST SET, ELECTRON TUBE	Operating Instructions for Vacuum Tube Tester Model KS-15750-L2 (Hickok) [1]	Testing electron tubes; general purpose portable tube tester.
TEST SET, null voltage		High-accuracy measurements of dc voltage; general purpose portable test set.
SCOPE, test	Instruction Manual for Cathode-Ray Oscilloscope, Type RM1G (Tektronix) [1]	Checks and adjustments of TRR system; cabinet mounted test oscilloscope.

[1] Manufacturer's manual.

175 (U). Null Voltage Test Set

a. Description.

(1) The null voltage test set (NVTS) is a portable test set for performing dc voltage measurements. Unlike multimeters, this test set (when balanced) draws no current from the circuit under test; therefore, very small voltages can be measured with extreme accuracy. The test set is used for checks and adjustments, for troubleshooting of the computer system, and for balancing of the +250 or +150 volt regulators. The controls, indicators, and binding posts of the test set are described in table 94.

Table 94 (U). Null Voltage Test Set—Controls, Indicators, and Binding Posts (U)

Control, indicator, or binding post	Type	Function
−250v binding post		When used with GND binding post, provides connection between external −250-volt power source and null voltage test set.
+250v binding post		When used with GND binding post, provides connection between external +250-volt power source and null voltage test set.
+BAT binding post		When used with GND binding post, provides connection between external positive battery power source and null voltage test set.
Galvanometer		Indicates the voltage null point of circuit under test. Meter is graduated from −15 to 0 to +15 in increments of 1.
Galvanometer CLAMP		Locks the pointer of galvanometer.
GND binding post		Provides connection between an external power source ground and null voltage test set. Used with −250v binding post, +250v binding post, or +BAT binding post.
Meter-zero knob	Rotary	Adjusts zero indication of galvanometer.
Null dial		Indicates 0 to 100 ohms as adjusted by null knob.
Null knob	Rotary	Adjusts resistance as indicated by null dial to obtain zero indication on galvanometer.
Resistance range switch (3)	Rotary (10-position)	To obtain zero indication on galvanometer, each switch selects resistance in nine steps. Amount of resistance selected by each step is the product of the switch setting and the panel marking below that switch. Total resistance selected is the sum of the products for all switches used. Total range is from 0 to 99,900 ohms.
SENSITIVITY—1 switch	Pushbutton	Selects low sensitivity for galvanometer.
SENSITIVITY—2 switch	Pushbutton	Selects medium sensitivity for galvanometer.
SENSITIVITY—3 switch	Pushbutton	Selects high sensitivity for galvanometer.
TEST—1 binding post		Provides connection between external circuit and null voltage test set.
TEST—2 binding post		Provides connection between external circuit and null voltage test set.
TEST—3 binding post		Provides connection between external circuit and null voltage test set.
TEST TERM switch	Rotary	Selects external circuit connected to TEST—1 binding post, TEST—2 binding post, or TEST—3 binding post.
VOLTS switch	Rotary (four-position)	Selects external +250 volts, −250 volts, or positive battery voltage connected to +BAT binding post, +250v binding post, or −250v binding post.

(2) The test set includes a precision voltage divider network and a galvanometer. The voltage divider network is controlled by three resistance range switches and the null knob. The positions of these controls indicate the ratio between the applied voltage and the output voltage of the voltage divider. The output of the voltage divider and the test voltage are applied to the galvanometer. When a null point (zero) is reached on the galvanometer, it indicates that the voltage from the voltage divider and the test voltage are equal. By this means, an unknown test voltage can be measured with an accuracy of 1 part in 100,000.

(3) Three supply voltage binding posts, −250V, +250V, and +BAT, are provided on the test set. The binding posts permit simultaneous application of three dc supply voltages to the test set. These binding posts are connected to the VOLTS switch which is used to select one of the voltages for applica-

tion to the voltage divider network. The GND binding post is connected directly to the voltage divider network.

(4) Three test voltage binding posts, TEST—1, TEST—2, and TEST—3, are also provided on the test set. These binding posts are connected to the TEST TERM switch which is used to select one test voltage and apply it to the galvanometer. This permits the comparison of as many as three test voltages without altering the test set connections.

(5) The galvanometer CLAMP is provided to lock the pointer of the galvanometer when the test set is not in use. The CLAMP is engaged by sliding it in the direction indicated by the arrow.

(6) The SENSITIVITY—1, SENSITIVITY—2, and SENSITIVITY—3 switches are provided to control the sensitivity of the galvanometer by varying the series resistance in the galvanometer circuit.

(7) Two NVTS connectors are located in the computer amplifier-relay group and one in the director station group to provide supply voltages for the test set.

(8) The test cord and assembly set include test lead 6625-761-6004 and test lead 6625-648-9152 for use with the test set. Test lead 6625-761-6004 connects the test set to an NVTS connector. Test lead 6625-648-9152 is a voltage pickoff lead.

b. Operation.

Warning: **Before operating null voltage test set, be sure that the three conditions below are satisfied.**

Condition 1. Test lead 6625-761-6004 is connected to test set binding posts before it is connected to NVTS connector.

Condition 2. Test set is reasonably level and not exposed to excessive vibration.

Condition 3. SENSITIVITY switches are not depressed unless galvanometer pointer is within one division of zero.

(1) *Measurement of known (suspected) voltage.*

(*a*) Check that VOLTS switch is set to OFF.

(*b*) Release galvanometer CLAMP, and check that galvanometer pointer indicates 0. If necessary, adjust pointer to 0 with meter-zero knob.

(*c*) Connect test lead 6625-648-9152 to TEST—1, TEST—2, or TEST—3 binding post, and connect other end of test lead to voltage test point.

(*d*) Set TEST TERM switch to 1, 2, or 3 to correspond with binding post connection made in (*c*) above.

Note. The 400 null voltage test set units equal 1 volt (one null voltage test set unit equals 2.5 mv) as indicated by settings of resistance range switches and null knob.

(*e*) Set resistance range switches and null knob to null voltage test set units corresponding to known (suspected) voltage.

(*f*) Set VOLTS switch to −250 or +250, depending on polarity and type of known (suspected) voltage.

(*g*) Obtain a null (0) indication on galvanometer by positioning null knob and depressing SENSITIVITY—1, SENSITIVITY—2, and SENSITIVITY—3 switches, in turn, as required.

Note. If known (suspected) voltage is greatly in error or missing, a null indication will not be obtained on galvanometer by positioning null knob. In this case, set VOLTS switch to OFF, and perform (2) below.

(*h*) Read value of voltage, in null voltage test set units, from resistance range switches and null dial, and convert to voltage.

(*i*) Set VOLTS switch to OFF.

Caution: **Be sure that galvanometer CLAMP is engaged to prevent possible damage to galvanometer.**

(*j*) Engage galvanometer CLAMP.

(*k*) Disconnect test leads.

(2) *Measurement of the unknown voltage.*

(*a*) Connect the test leads, and position the switches as prescribed in *b*(1) (*a*) through (*d*) above.

(*b*) Set the resistance range switches and null knob to 0.

Note. If unknown voltage is zero, the galvanometer pointer will remain at 0 regardless of the VOLTS switch setting, even if the SENSITIVITY switches are depressed.

(*c*) Set the VOLTS switch to +250. If the galvanometer pointer swings to left of 0, the unknown voltage is negative, and the VOLTS switch must be set to −250.

(*d*) Adjust the X10000 resistance range switch clockwise until the galvanometer pointer moves to the left of 0, then return the switch counterclockwise one position.

(*e*) Adjust the X1000 and X100 resistance range switches, in turn, as prescribed in (*d*) above.

Note. It may be necessary to reposition the X100 resistance range switch.

(*f*) Obtain a null (0) indication on the galvanometer by adjusting the null knob and depressing SENSITIVITY—1, SENSITIVITY—2, and SENSITIVITY—3 switches in turn.

Note. The 400 null voltage test set units equal 1 volt. (One null voltage test set unit equals 2.5 mv.)

(*g*) Read the value of the unknown voltage in the null voltage test set units from the resistance range switches and the null dial, and convert to voltage.

(*h*) Set the VOLTS switch to OFF.

***Caution:* Be sure that the galvanometer CLAMP is engaged to prevent possible damage to the galvanometer.**

(*i*) Engage the galvanometer CLAMP.

(*j*) Disconnect the test leads.

(3) *Balancing the +250 and −250 or +150 volt regulators.*

(*a*) Perform (1) (*a*) through (*d*) above.

(*b*) Set the resistance range switches and null knob to 50,000.

(*b.1*) Connect test lead 6625–648–9152 to circuit ground.

(*b.2*) Depress and hold the +250V BAL switch.

(*c*) Set the VOLTS switch to +250.

(*d*) Adjust the regulator balance variable resistor until null is obtained on the galvanometer.

***Caution:* Set the VOLTS switch to OFF before releasing the +250V BAL switch to prevent damage to the galvanometer.**

(*e*) Perform (1) (*i*) through (*k*) above.

CHAPTER 10 (U)

SERVICE UPON RECEIPT AND PREVENTIVE MAINTENANCE

Section I (U). INTRODUCTION

176 (U). General

This chapter provides instructions for service upon receipt and preventive maintenance of the RCDC.

177 (U). Scope

Section II contains general and specific instructions for service upon receipt of the equipment. Section III contains instructions for cleaning the equipment. Section IV contains operator's service information. Section V describes preventive maintenance. Section VI contains information on lubrication and painting of the equipment.

Section II (U). SERVICE UPON RECEIPT

178 (U). General

When an RCDC is received by a using organization, it is the responsibility of the officer in charge to determine the operational condition of the equipment. Battery personnel are responsible for inspecting all assemblies, subassemblies, and associated components to make certain that the equipment is properly assembled, secured, and cleaned. Use care when examining the equipment to avoid the loss of small parts that could affect the operation of the system. Make an immediate record of any missing part and submit record through appropriate channels. Repair any damaged part as soon as possible.

179 (U). Points of Inspection

a. TM 9-1400-250-12 lists all points that must be inspected upon receipt of the RCDC.

b. After deficiences are corrected, perform the checks and adjustments prescribed in TM 9-1430-251-12/1, TM 9-1430-255-12/1, and TM 9-1430-256-12/1, before placing the system into tactical operation.

180 (U). Tags

Carefully read and follow instructions on all tags attached to the equipment. The information on these tags may be in the form of notes, cautions, or warnings. Remove any tag that might interfere with installation and operation. Record, for future reference, all information given on these tags.

181 (U). Modification Work Orders

Inspect the equipment to determine that all pertinent Department of the Army modification work orders (DA MWO's) have been applied and that no unauthorized modifications have been made. Refer to TM 9-1430-257-20, TM 9-1430-258-20, and TM 9-1430-259-20 for a current list of DA MWO's.

Section III (U). CLEANING

182 (U). General

Dirt and dust are a frequent cause of equipment malfunctions. Therefore, all components of the RCDC must be cleaned periodically.

a. Precautions. Certain precautions must be observed during cleaning. Failure to comply with the precautions listed below may result in harm to personnel and damage to equipment.

Warning: **When using trichloroethane or mineral spirits, be sure that the area is well ventilated as the fumes are toxic, and mineral spirits are flammable.**

(1) The rapid evaporation of cleaning fluids when exposed to excessive heat has a drying effect on the skin. Wear rubber gloves to avoid possible crack-

ing, irritation, or inflammation of the skin.

(2) Avoid direct contact between petroleum products and rubber parts, since petroleum products cause rubber to harden, crack, or dissolve. When contact is unavoidable, quickly wash affected parts with a solution of soap and water. Rinse and dry thoroughly.

(3) Use of gasoline or benzene as a cleaning agent is prohibited.

b. Cleaning Instructions. General cleaning instructions are prescribed below.

(1) Dust and sweep daily to remove dirt and loose items which might get into the equipment and cause a malfunction.

Caution: **Use suction. Do not blow dust out of equipment.**

(2) Clean assemblies and components within cabinets and consoles monthly. If a vacuum cleaner is used near critical electronic equipment, use care to avoid damaging the equipment.

(3) Use trichloroethane 6810-664-0387 to clean or wash grease and oil from components. Refer to *a* above for precautions pertaining to use of trichloroethane.

(4) For general cleaning of painted surfaces and rubber parts, use clean water or a solution of one cup of soap chips to one gallon of hot water. After parts are cleaned, rinse and dry thoroughly.

(5) Use a clean, lint-free cloth moistened with antistatic and cleaning compound 6850-368-527 to clean all glass and plastic surfaces and to remove wax pencil markings from early warning plotting board.

(6) Clean lenses with lens paper 6640-162-2994.

(7) Cleaners which are authorized for use are listed in the TM's described in paragraph 172*b*.

183 (U). Location and Maintenance of Air Conditioning Filters

Air conditioning filters provided in the RCDC are permanent-type filters. However, these filters become dirty and clogged and must be removed, cleaned, charged, and reinstalled. Typical maintenance procedures are described in *a* through *c* below.

a. Trailer Mounted Director or Tracking Stations.

Caution: **To prevent damage to equipment, set MAIN POWER switch on acquisition control panel to OFF before performing any maintenance on air conditioning filters.**

Note. Trailer mounted director and tracking stations that are emplaced against the interconnecting corridor do not use the air conditioning filters in the entrance doors.

(1) *Removal of air conditioning filter.*

Note. The key numbers shown in parentheses in (*a*) through (*c*) below refer to figure 125.

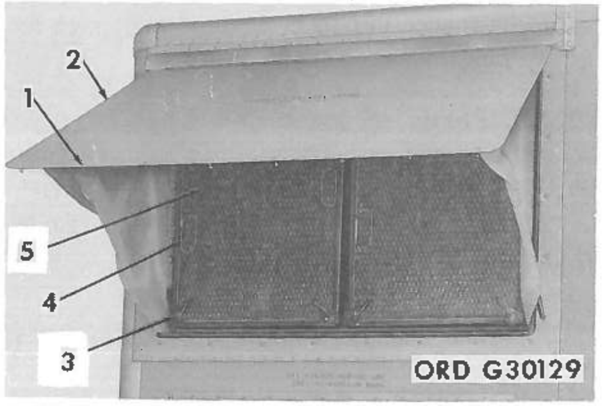
(*a*) If EQUIPMENT COOLING INTAKE door (2) is closed, release captive fasteners (1) and open door.

(*b*) Release latches (3) securing each air conditioning filter (5).

(*c*) Grasp rings (4) and remove each filter.

(2) *Cleaning of air conditioning filters.*

(*a*) Fill pan assembly 4925-217-2220 to a depth of approximately 2 inches



1—Captive fastener (18)
2—EQUIPMENT COOLING INTAKE door
3—Latch (4)
4—Ring (4)
5—Air conditioning filter 4130-269-6242 (2)

Figure 125 (U). Trailer mounted director and tracking stations—typical partial right side view (U).

CHAPTER 10 (U)
SERVICE UPON RECEIPT AND PREVENTIVE MAINTENANCE

Section I (U). INTRODUCTION

176 (U). General

This chapter provides instructions for service upon receipt and preventive maintenance of the RCDC.

177 (U). Scope

Section II contains general and specific instructions for service upon receipt of the equipment. Section III contains instructions for cleaning the equipment. Section IV contains operator's service information. Section V describes preventive maintenance. Section VI contains information on lubrication and painting of the equipment.

Section II (U). SERVICE UPON RECEIPT

178 (U). General

When a RCDC is received by a using organization, it is the responsibility of the officer in charge to determine the operational condition of the equipment. Battery personnel are responsible for inspecting all assemblies, subassemblies, and associated components to make certain that the equipment is properly assembled, secured, and cleaned. Use care when examining the equipment to avoid the loss of small parts that could affect the operation of the system. Make an immediate record of any missing part and submit record through appropriate channels. Repair any damaged part as soon as possible.

179 (U). Points of Inspection

a. TM 9-1400-250-12 lists all points that must be inspected upon receipt of the RCDC.

b. After deficiencies are corrected, perform the checks and adjustments prescribed in TM 9-1430-251-20/2 before placing the system into tactical operation.

180 (U). Tags

Carefully read and follow instructions on all tags attached to the equipment. The information on these tags may be in the form of notes, cautions, or warnings. Remove any tag that might interfere with installation and operation. Record, for future reference, all information given on these tags.

181 (U). Modification Work Orders

Inspect the equipment to determine that all pertinent Department of the Army modification work orders (DA MWO's) have been applied and that no unauthorized modifications have been made. Refer to TM 9-1430-257-20, TM 9-1430-258-20, and TM 9-1430-259-20 for a current list of DA MWO's.

Section III (U). CLEANING

182 (U). General

Dirt and dust are a frequent cause of equipment malfunctions. Therefore, all components of the RCDC must be cleaned periodically.

a. Precautions. Certain precautions must be observed during cleaning. Failure to comply with the precautions listed below may result in harm to personnel and damage to equipment.

Warning: **When using trichloroethane or mineral spirits, be sure that the area is well ventilated as the fumes are toxic, and mineral spirits are flammable.**

(1) The rapid evaporation of cleaning fluids when exposed to excessive heat has a drying effect on the skin. Wear rubber gloves to avoid possible crack-

ing, irritation, or inflammation of the skin.

(2) Avoid direct contact between petroleum products and rubber parts, since petroleum products cause rubber to harden, crack, or dissolve. When contact is unavoidable, quickly wash affected parts with a solution of soap and water. Rinse and dry thoroughly.

(3) Use of gasoline or benzene as a cleaning agent is prohibited.

b. Cleaning Instructions. General cleaning instructions are prescribed below.

(1) Dust and sweep daily to remove dirt and loose items which might get into the equipment and cause a malfunction.

Caution: **Use suction. Do not blow dust out of equipment.**

(2) Clean assemblies and components within cabinets and consoles monthly. If a vacuum cleaner is used near critical electronic equipment, use care to avoid damaging the equipment.

(3) Use trichloroethane 6810-664-0387 to clean or wash grease and oil from components. Refer to *a* above for precautions pertaining to use of trichloroethane.

(4) For general cleaning of painted surfaces and rubber parts, use clean water or a solution of one cup of soap chips to one gallon of hot water. After parts are cleaned, rinse and dry thoroughly.

(5) Use a clean, lint-free cloth moistened with antistatic and cleaning compound 6850-368-527 to clean all glass and plastic surfaces and to remove wax pencil markings from early warning plotting board.

(6) Clean lenses with lens paper 6640-162-2994.

(7) Cleaners which are authorized for use are listed in the TM's described in paragraph 172*b*.

183 (U). Location and Maintenance of Air Conditioning Filters

Air conditioning filters provided in the RCDC are permanent-type filters. However, these filters become dirty and clogged and must be removed, cleaned, charged, and reinstalled. Typical maintenance procedures are described in *a* through *c* below.

a. Trailer Mounted Director or Tracking Stations.

Caution: **To prevent damage to equipment, set MAIN POWER switch on acquisition control panel to OFF before performing any maintenance on air conditioning filters.**

Note. Trailer mounted director and tracking stations that are emplaced against the interconnecting corridor do not use the air conditioning filters in the entrance doors.

(1) *Removal of air conditioning filter.*

Note. The key numbers shown in parentheses in (*a*) through (*c*) below refer to figure 125.

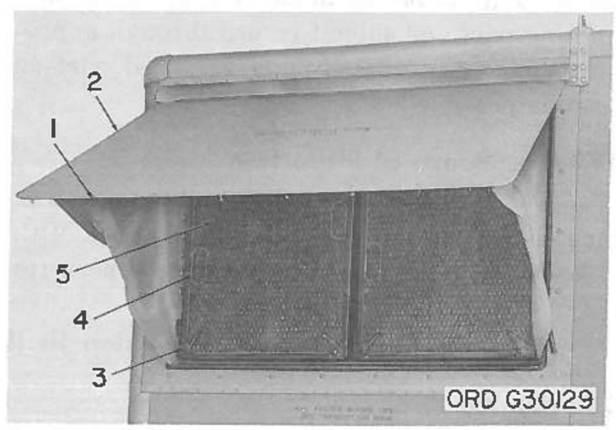
(*a*) If EQUIPMENT COOLING INTAKE door (2) is closed, release captive fasteners (1) and open door.

(*b*) Release latches (3) securing each air conditioning filter (5).

(*c*) Grasp rings (4) and remove each filter.

(2) *Cleaning of air conditioning filters.*

(*a*) Fill pan assembly 4925-217-2220 to a depth of approximately 2 inches



1—Captive fastener (18)
2—EQUIPMENT COOLING INTAKE door
3—Latch (4)
4—Ring (4)
5—Air conditioning filter 4130-269-6242 (2)

Figure 125 (U). Trailer mounted director and tracking stations—typical partial right side view (U).

with trichloroethane 6810–664–0387.

(*b*) Immerse air conditioning filter with coarse mesh side down in trichloroethane and agitate until filter is clean.

(*c*) Remove filter from trichloroethane and place in a horizontal position until thoroughly dry.

(*d*) Discard trichloroethane and clean pan assembly.

(3) *Charging of air conditioning filters.*

Note. Use of lubricating oil 9150-265-9432 for ambient temperatures between −45° F (42.8° C) and +19° F (−7.2° C) and lubricating oil 9150-265-9439 for ambient temperatures above +19° F (−7.2° C).

(*a*) Fill pan assembly 4925–217–2220 to a depth of approximately 2 inches with appropriate lubricating oil.

(*b*) Immerse clean air conditioning filter in oil.

(*c*) Remove filter from oil and place in a horizontal position to drain for 24 hours.

(*d*) If filter is not installed immediately after draining, wrap in greaseproof paper until needed.

(4) *Installation of air conditioning filters.*

(*a*) Install each air conditioning filter (5, fig. 125) with rings (4, fig. 125) to outside.

(*b*) Secure each filter with latches (3, fig. 125).

Note. The EQUIPMENT COOLING INTAKE door should normally be left open.

b. LOPAR Antenna-Receiver-Transmitter Group.

(1) *Removal of air filter.*

(*a*) Release captive fasteners and remove filter access cover (fig. 37).

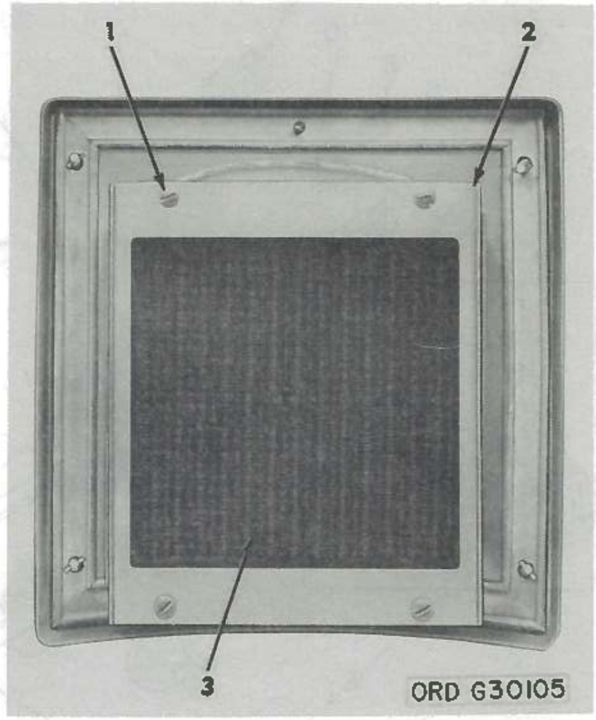
(*b*) Release captive fasteners (1, fig. 126) and remove retainer frame assembly (2, fig. 126).

(*c*) Remove air filter (3, fig. 126).

(2) *Cleaning of air filter.* Clean air filter as prescribed in *a*(2) above.

(3) *Charging of air filter.* Charge air filter as prescribed in *a*(3) above.

(4) *Installation of air filter.*



1—Captive fastener (4)
2—Retainer frame assy
3—Air filter 7660683

Figure 126 (U). Cover assembly—typical inside view (U).

(*a*) Install and secure air filter and retainer frame assembly.

(*b*) Install and secure cover assembly.

c. Missile Track, Target Track, and Target Range Antenna-Receiver-Transmitter Groups.

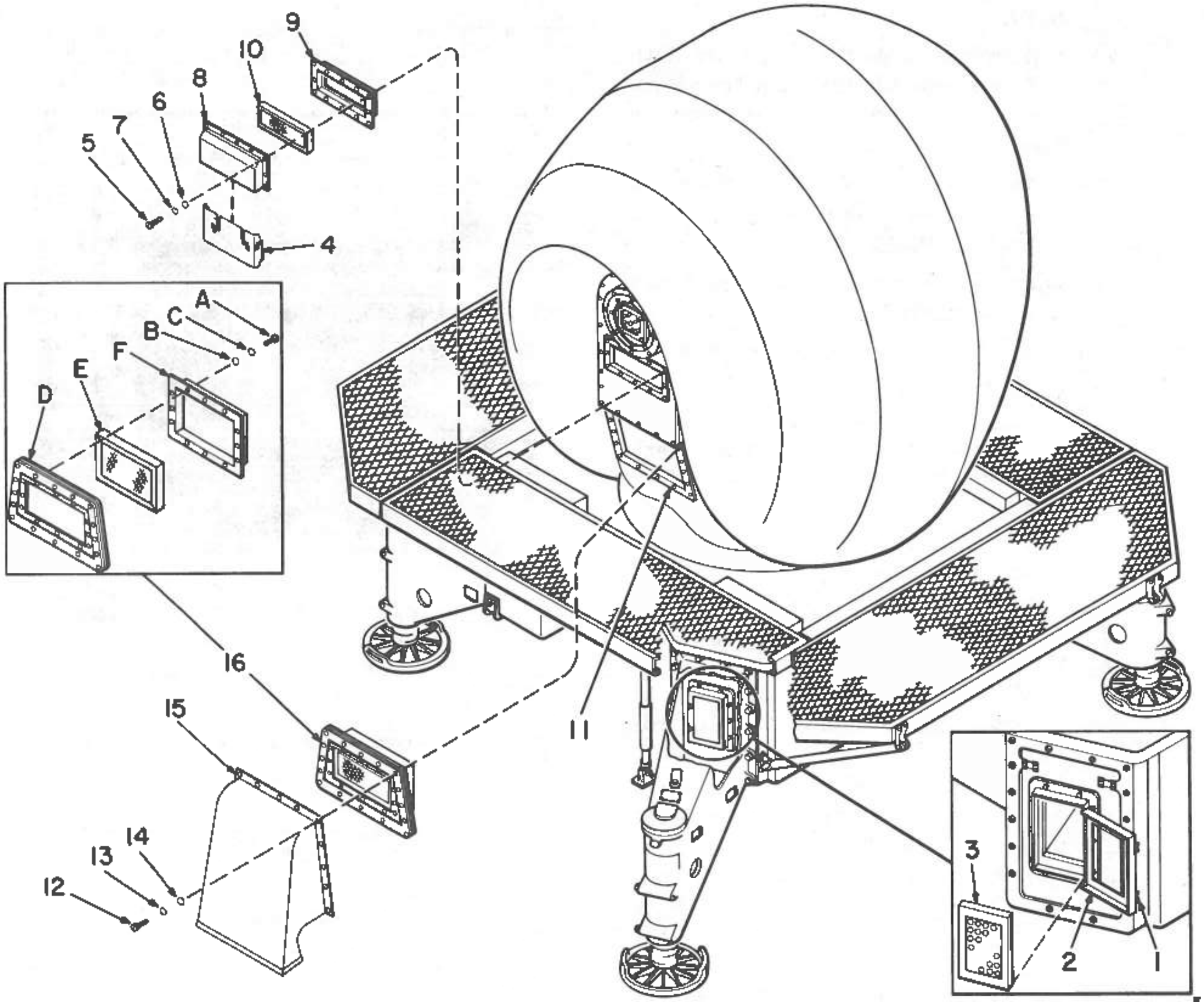
(1) *Azimuth drive equipment enclosure.*

(*a*) *Removal of filter unit.*

1. Loosen captive fasteners (1, fig. 127) and open filter frame assembly (2, fig. 127).

2. Remove filter unit (3, fig. 127) from filter frame assembly.

(*b*) Cleaning of filter unit. Rap the filter unit to remove excess contaminates. Remove the pliable non-cellular polyurethane filter from the frame and flush this material opposite the air flow direction with a jet of water from a hose. Then wash the filter with warm water and a mild detergent. Rinse the filter



1—Captive fastener (2)
2—Filter frame assy
3—Filter unit 10167487
4—Shield
5—No. 10-24 x 7/16 fil-hd screw 9407614 (12)
6—7/32 in. id fl washer 446161 (12)
7—No. 10 lock washer MS35338-24 (12)
8—Cover 9004340
9—Filter holder assy 9004363
10—Air conditioning filter 10167572
11—Track antenna pedestal
12—5/16-18 UNC-2A x 1-1/8 socket-hd cap screw 10015277 (16)
13—5/16 in. lock washer MS35338-26 (16)
14—5/16 in. id fl washer MS27183-12 (16)
15—Dehumidifier subassy 10167519
16—Air conditioning filter assy 9004366
- A—No. 10-24 x 1/2 pan-hd screw MS35206-263 (12)
- B—0.437 in. id fl washer MS27183-8 (12)
- C—No. 10 lock washer MS35338-24 (12)
- D—Frame assy
- E—Air conditioning filter 10167483
- F—Frame 8171794

Figure 127 (U). Missile track, target track, or target range antenna-receiver-transmitter groups—typical partially exploded view (U).

thoroughly with water and allow it to dry completely. Install the filter in the frame.

(c) *Charging of filter unit.* Charging the filter is not required.

(d) *Installation of filter unit.*

with trichloroethane 6810-664-0387.

(*b*) Immerse air conditioning filter with coarse mesh side down in trichloroethane and agitate until filter is clean.

(*c*) Remove filter from trichloroethane and place in a horizontal position until thoroughly dry.

(*d*) Discard trichloroethane and clean pan assembly.

(3) *Charging of air conditioning filters.*

Note. Use lubricating oil 9150-265-9432 for ambient temperatures between −45° F (42.8° C) and +19° F (−7.2° C) and lubricating oil 9150-265-9439 for ambient temperatures above +19° F (−7.2° C).

(*a*) Fill pan assembly 4925-217-2220 to a depth of approximately 2 inches with appropriate lubricating oil.

(*b*) Immerse clean air conditioning filter in oil.

(*c*) Remove filter from oil and place in a horizontal position to drain for 24 hours.

(*d*) If filter is not installed immediately after draining, wrap in greaseproof paper until needed.

(4) *Installation of air conditioning filters.*

(*a*) Install each air conditioning filter (5, fig. 125) with rings (4, fig. 125) to outside.

(*b*) Secure each filter with latches (3, fig. 125).

Note. The EQUIPMENT COOLING INTAKE door should normally be left open.

b. LOPAR Antenna-Receiver-Transmitter Group.

(1) *Removal of air filter.*

(*a*) Release captive fasteners and remove filter access cover (fig. 37).

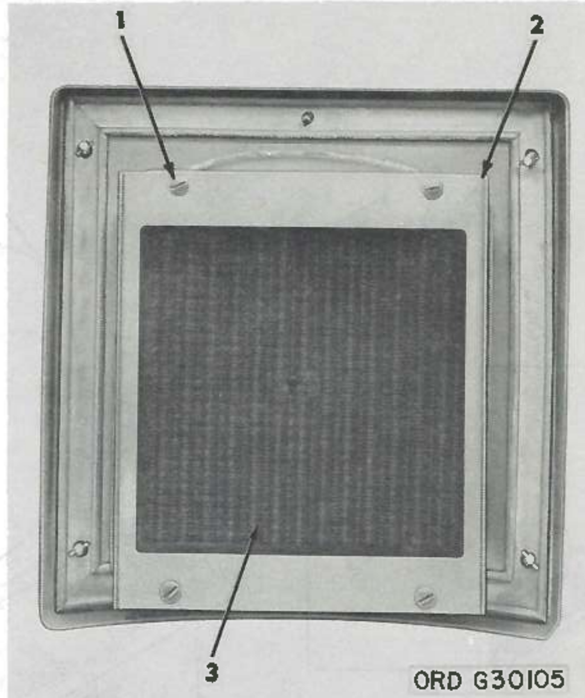
(*b*) Release captive fasteners (1, fig. 126) and remove retainer frame assembly (2, fig. 126).

(*c*) Remove air filter (3, fig. 126).

(2) *Cleaning of air filter.* Clean air filter as prescribed in *a*(2) above.

(3) *Charging of air filter.* Charge air filter as prescribed in *a*(3) above.

(4) *Installation of air filter.*



1—Captive fastener (4)
2—Retainer frame assembly
3—Air filter 1285-692-1461

Figure 126 (U). Cover assembly—typical inside view (U).

(*a*) Install and secure air filter and retainer frame assembly.

(*b*) Install and secure cover assembly.

c. Missile Track, Target Track, and Target Range Antenna-Receiver-Transmitter Groups.

(1) *Azimuth drive equipment enclosure.*

(*a*) *Removal of filter unit.*

1. Loosen captive fasteners (1, fig. 127) and open filter frame assembly (2, fig. 127).

2. Remove filter unit (3, fig. 127) from filter frame assembly.

(*b*) *Cleaning of filter unit.* Clean filter unit as prescribed in *a*(2) above.

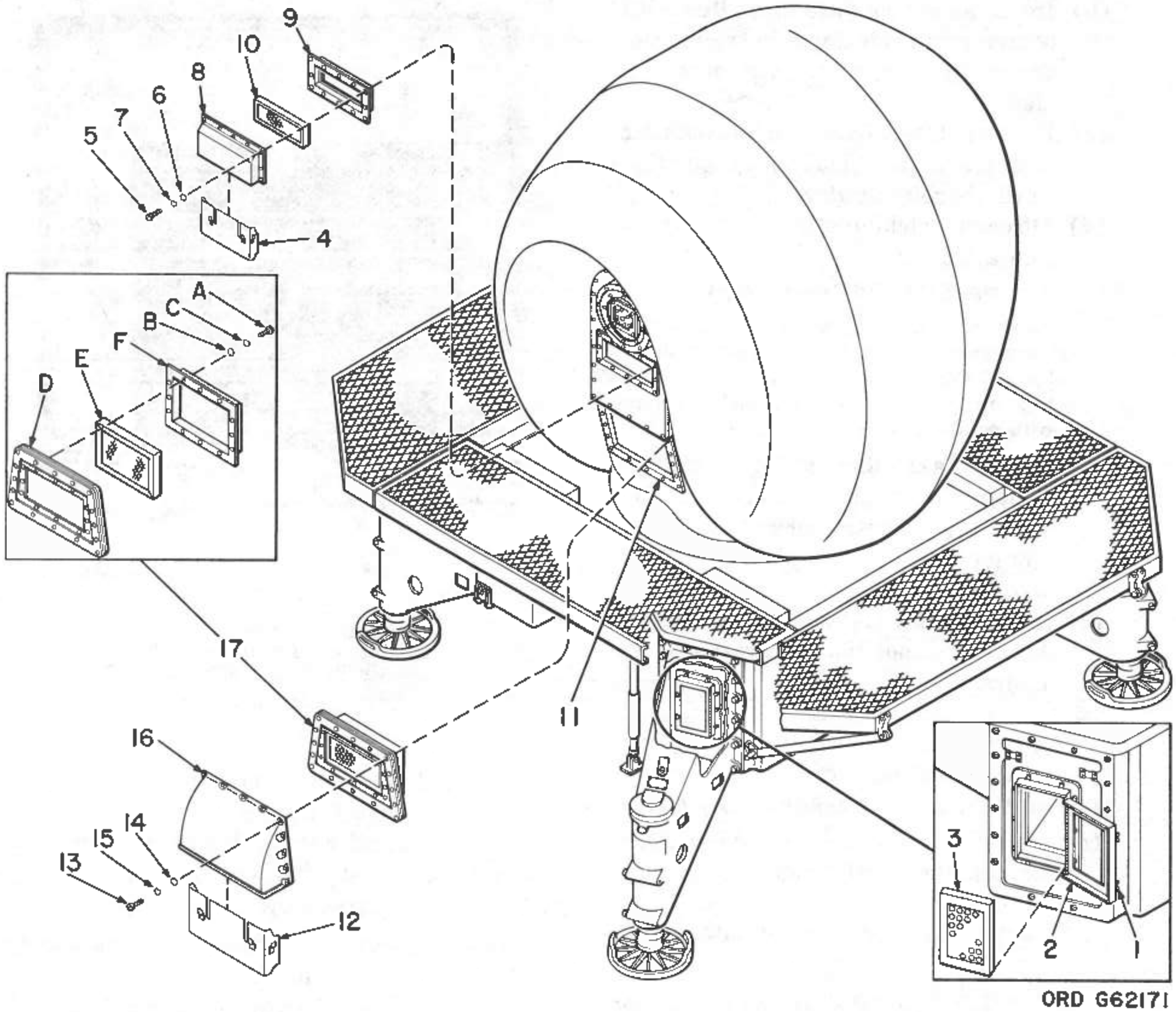
(*c*) *Charging of filter unit.* Charge filter unit as prescribed in *a*(3) above.

(*d*) *Installation of filter unit.*

1. Position filter unit in filter frame assembly.

2. Close and secure filter frame assembly.

Warning: **Before working on or around track antenna pedestal, en-**



1—Captive fastener (2)
2—Filter frame assembly
3—Filter unit 1430-563-3787
4—Shield
5—No. 10-24 x 7/16 fil-hd screw 5305-013-2037 (12)
6—7/32-in-id fl washer 5310-044-6161 (12)
7—No. 10 lock washer 5310-012-0217 (12)
8—Cover 9004340
9—Filter holder assembly 9004363
10—Air conditioning filter 4130-587-2403
11—Track antenna pedestal
12—Shield
13—5/16-18 x 1½ socket-hd cap screw 5305-616-8116 (16)
14—11/32-in-id fl washer MS15795-212 (16)
15—5/16-in. lock washer 5310-605-2985 (16)
16—Cover 9004341
17—Air conditioning filter assembly 9004366
- A—No. 10-24 x ½ pan-hd screw 5305-043-6732 (12)
- B—0.437-in-id fl washer 5310-596-7608 (12)
- C—No. 10 lock washer 5310-012-0217 (12)
- D—Gasket 9004351
- E—Air conditioning filter 4130-561-7987
- F—Frame 8171794

Figure 127 (U). Missile track, target track, and target range antenna-receiver-transmitter groups—typical partially exploded view (U).

gage azimuth transit lock by loosening hexagon-head bolt (3, fig. 45), engaging slide (azimuth antirotational lock) (2, fig. 45) with track antenna pedestal (1, fig. 45), and tightening hexagon-head bolt to prevent acci-

1. Position filter unit in filter frame assembly with the air flow arrow pointing into the pedestal.

2. Close and secure filter frame assembly.

Warning: **Before working on or around the track antenna pedestal, engage the azimuth transit lock by loosening hexagon-head bolt (3, fig. 45), engaging slide (azimuth antirotational lock) (2, fig. 45) with track antenna pedestal (1, fig. 45), and tightening hexagon-head bolt to prevent accidental movement of pedestal, which might cause injury to personnel.**

(2) *Track antenna pedestal.*

(*a*) *Removal of upper air conditioning filter.*

Note. The key numbers shown in parentheses in *1* through *3* and (*d*), (*e*), and (*h*) below refer to figure 127.

1. Remove shield (4).

2. Remove fillister-head screws (5), flat washers (6), lock washers (7), cover (8), and filter holder assembly (9).

3. Remove air conditioning filter (10) from filter holder assembly.

(*b*) *Cleaning of filter unit.* Rap the filter unit to remove excess contaminates. Remove the pliable non-cellular polyurethane filter from the frame and flush this material opposite the air flow direction with a jet of water from a hose. Then wash the filter with warm water and a mild detergent. Rinse the filter thoroughly with water and allow it to dry completely. Install the filter in the frame.

(*c*) *Charging of filter unit.* Charging the filter is not required.

(*d*) *Installation of upper air conditioning filter.*

1. Place air conditioning filter (10) in filter holder assembly with the air flow arrow pointing into the pedestal.

2. Install and secure filter holder assembly and cover (8) on track antenna pedestal (11).

3. Install shield (4).

(*e*) *Removal of lower air conditioning filter.*

1. Remove socket-head cap screws (12), flat washers (14), lock washers (13), dehumidifier subassembly (15), and air conditioning filter assembly (16).

2. Remove pan-head screws (16A), flat washers (16B), lock washers (16C), frame assembly (16D), and air conditioning filter (16E) from frame (16F).

(*f*) *Cleaning of filter unit.* Rap the filter unit to remove excess contaminates. Remove the filter from the frame and flush this material opposite the air flow direction with a jet of water from a hose. Then wash the filter with warm water and a mild detergent. Rinse the filter material thoroughly with water and allow it to dry completely. Install the filter in the frame.

(*g*). *Charging of filter unit.* Charging the filter is not required.

(*h*) *Installation of lower air conditioning filter.*

1. Install air conditioning filter (16E) in frame (16F).

2. Install and secure the frame assembly on the frame.

3. Install and secure air conditioning filter assembly (16) and dehumidifier subassembly (15) on track antenna pedestal.

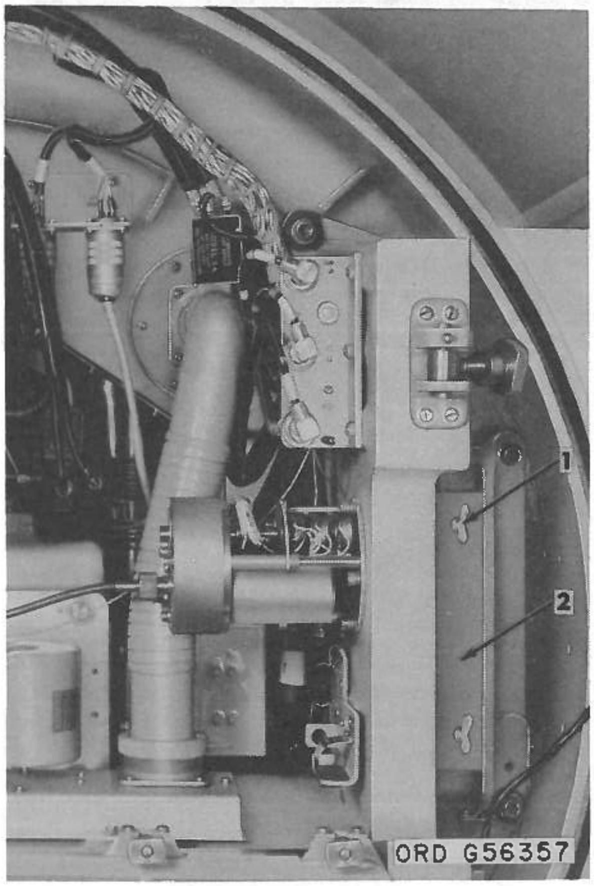
(3) *Missile track, target track, and target range antenna-receiver-transmitters.*

(*a*) *Removal of air conditioning filter.*

1. Gain access to air conditioning filter assembly (2, fig. 128) in missile track, traget track, or target range antenna-receiver-transmitter.

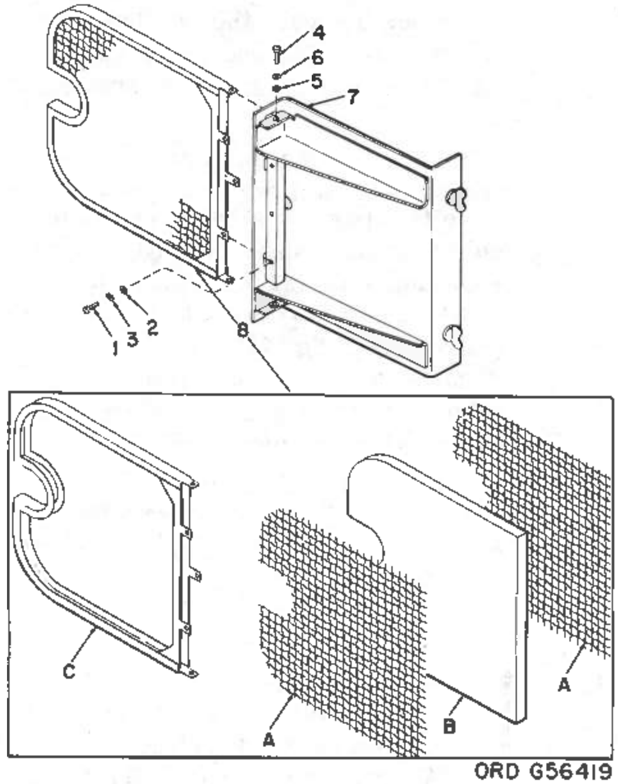
2. Loosen captive fasteners (1, fig. 128), and remove air conditioning filter assembly.

Note. The key numbers shown in parentheses in *3* and *4* below refer to figure 129.



1—Captive fastener (2)
2—Air conditioning filter assy 8171042 (2)

Figure 128 (U). Missile track, target track, and target range antenna-receiver-transmitters—typical partial rear interior view (U).



1—No. 6-32 x 1/2 fil-hd screw 5303-013-1899 (3)
2—5/32-in-id fl washer 5310-013-1014 (3)
3—No. 6 lock washer MS35338-22 (3)
4—No. 6-32 x 5/16 fil-hd screw 5303-013-1885 (2)
5—5/32-in-id fl washer 5310-013-1014 (2)
6—No. 6 lock washer MS35338-22 (2)
7—Bracket 8171044
8—Filter frame assy 9000044
A—Wire fabric 8174183 (2)
B—Air conditioning filter 8171026
C—Filter frame 8171043

Figure 129 (U). Air conditioning filter assembly —exploded view (U).

3. Remove fillister-head screws (1 and 4), flat washers (2 and 5), and lock washers (3 and 6); separate bracket (7) from filter frame assembly (8).

4. Remove wire fabric (8A) and air conditioning filter (8B) from filter frame (8C).

(*b*) *Cleaning of filter unit.* Clean the filter as prescribed in *a*(2) above.

(*c*) *Charging of filter unit.* Charge the filter unit as prescribed in *a* (3) above.

(*d*) *Installation of air conditioning filter.*

1. Install air conditioning filter (8B, fig. 129) and wire fabrics (8A, fig. 129) in filter frame (8C, fig. 129).

2. Secure filter frame assembly to bracket.

3. Install and secure air conditioning filter assembly (2, fig. 128).

4. *Close and secure cover assembly* and radome door.

d. Radar Test Set.

(1) *Removal of rear air conditioning filter.*

(*a*) Loosen captive screws (1, fig. 130) and remove hood assembly (2, fig. 130).

dental movement of pedestal, which might cause injury to personnel.

(2) *Track antenna pedestal.*

(*a*) *Removal of upper air conditioning filter.*

Note. The key numbers shown in parentheses in *1* through *3* and (*d*), (*e*), and (*h*) below refer to figure 127.

1. Remove shield (4).

2. Remove fillister-head screws (5), flat washers (6), lock washers (7), cover (8), and filter holder assembly (9).

3. Remove air conditioning filter (10) from filter holder assembly.

(*b*) *Cleaning of air conditioning filter.* Clean air conditioning filter as prescribed in *a*(2) above.

(*c*) *Charging of air conditioning filter.* Charge air conditioning filter as prescribed in *a*(3) above.

(*d*) *Installation of upper air conditioning filter.*

1. Place air conditioning filter (10) in filter holder assembly.

2. Install and secure filter holder assembly and cover (8) on track antenna pedestal (11).

3. Install shield (4).

(*e*) *Removal of lower air conditioning filter.*

1. Remove shield (12).

2. Remove socket-head cap screws (13), flat washers (14), lock washers (15), cover (16), and air conditioning filter assembly (17).

3. Remove pan-head screws (17A), flat washers (17B), lock washers (17C), gasket (17D), and air conditioning filter (17E) from frame (17F).

(*f*) *Cleaning of air conditioning filter.* Clean air conditioning filter as prescribed in *a*(2) above.

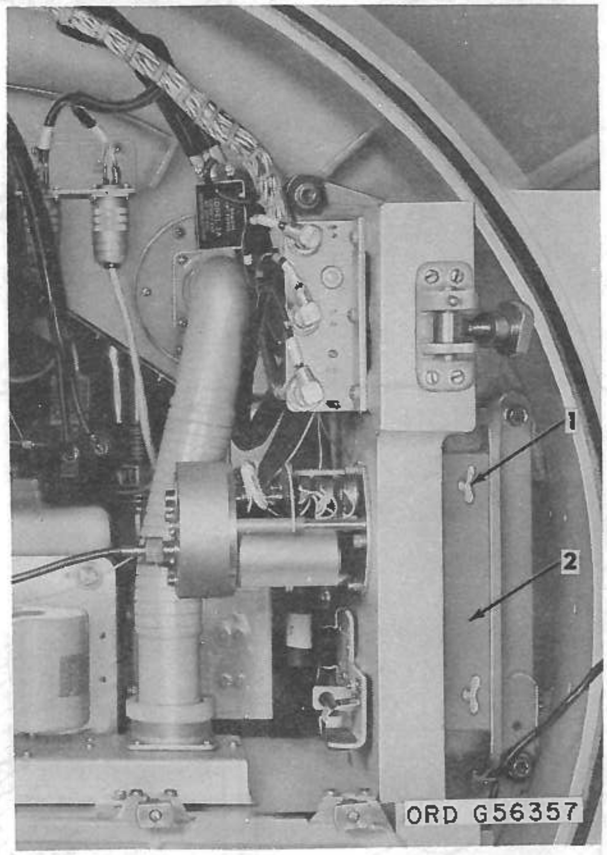
(*g*) *Charging of air conditioning filter.* Charge air conditioning filter as prescribed in *a*(3) above.

(*h*) *Installation of lower air conditioning filter.*

1. Install air conditioning filter (17E) in frame (17F).

2. Install and secure gasket on frame.

3. Install and secure air condition-



1—Captive fastener (2)
2—Air conditioning filter assembly 8171042 (2)

Figure 128 (U). Missile track, target track, and target range antenna-receiver-transmitters—typical partial rear interior view (U).

1—No. 6-32 x ½ fil-hd screw 5303-013-1899 (3)
2—⁵⁄₃₂-in-id fl washer 5310-013-1014 (3)
3—No. 6 lock washer 5310-045-0591 (3)
4—No. 6-32 x ⁵⁄₁₆ fil-hd screw 5303-013-1885 (2)
5—⁵⁄₃₂-in-id fl washer 5310-013-1014 (2)
6—No. 6 lock washer 5310-045-0591 (2)
7—Bracket 8171044
8—Filter frame assembly 9000044
A—Wire fabric 8174183 (2)
B—Air conditioning filter 4130-561-7989
C—Filter frame 8171043

Figure 129 (U). Air conditioning filter assembly—exploded view—legend (U).

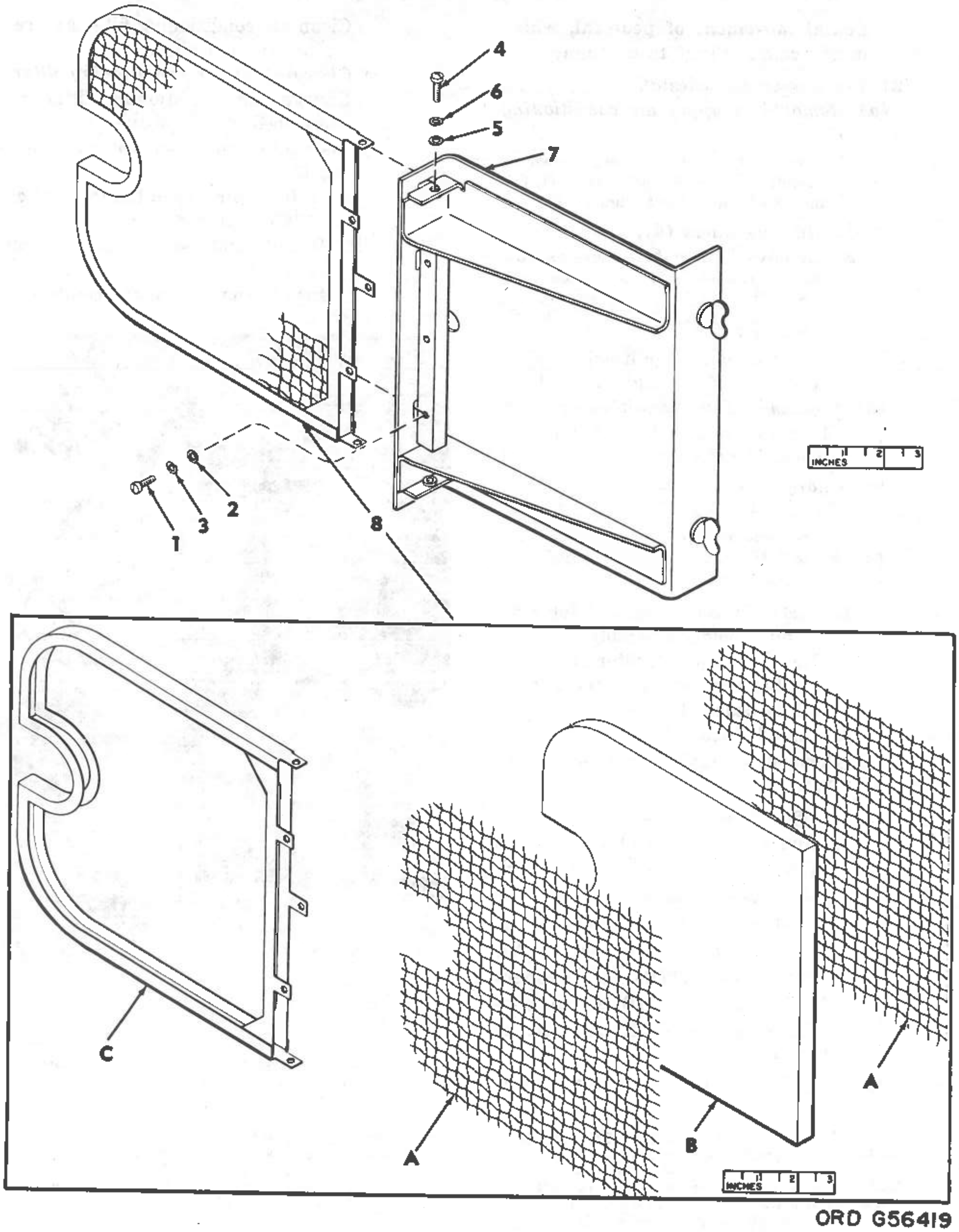
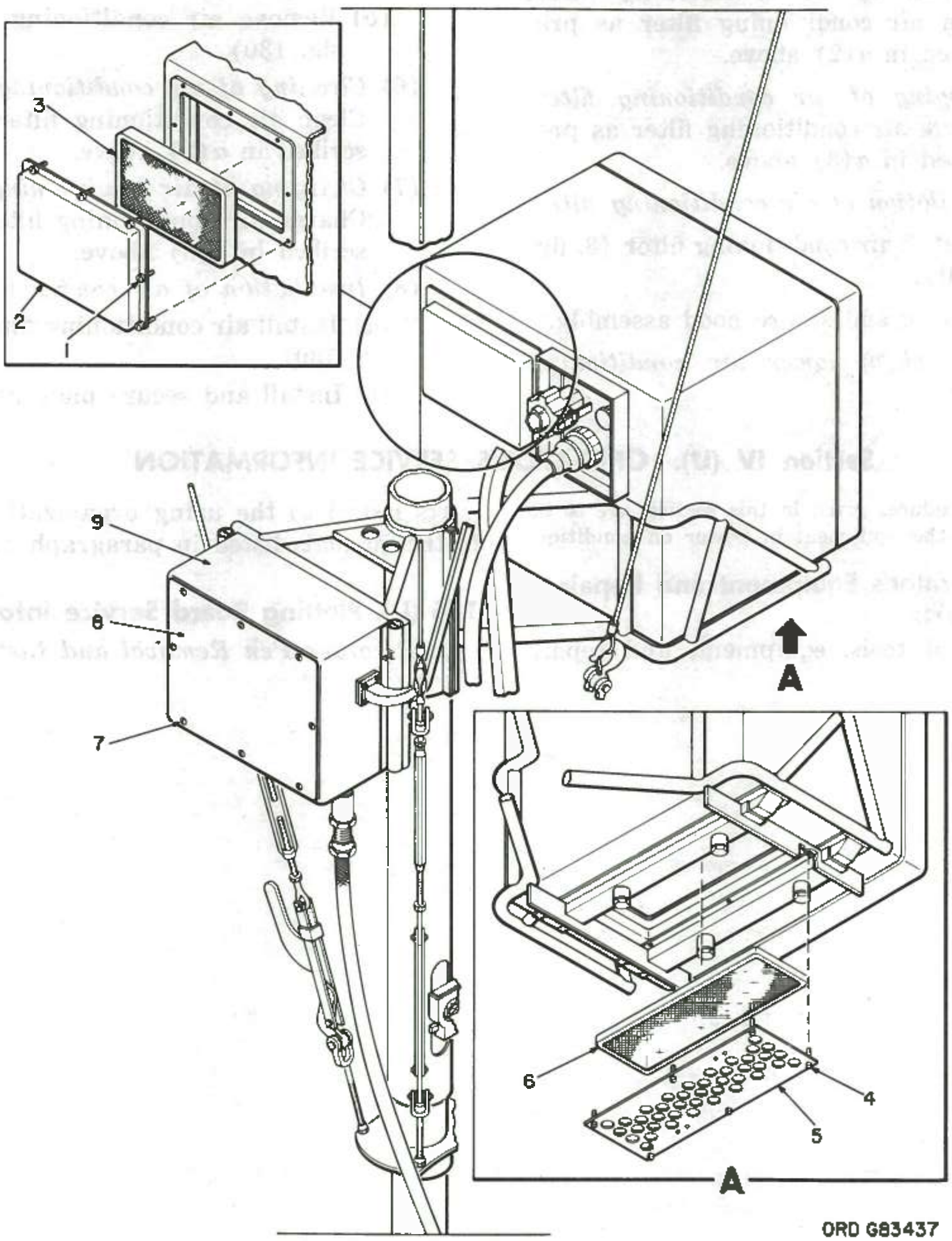


Figure 129 (U). Air conditioning filter assembly—exploded view (U).



1—Captive screw (7)
2—Hood assy 8024177
3—Air conditioning filter 4130-322-7800
4—Captive screw (6)
5—Plate assy 8024175
6—Air conditioning filter 4130-322-7799
7—Captive fastener (8)
8—Test set cover 9136717
9—Electrical equipment cabinet

Figure 130 (U). Radar test set group—partially exploded view (U).

(*b*) Remove air conditioning filter (3, fig. 130).

(2) *Cleaning of air conditioning filter.* Clean air conditioning filter as prescribed in *a*(2) above.

(3) *Charging of air conditioning filter.* Charge air conditioning filter as prescribed in *a*(3) above.

(4) *Installation of air conditioning filter.*

(*a*) Install air conditioning filter (3, fig. 130).

(*b*) Install and secure hood assembly.

(5) *Removal of lower air conditioning filter.*

(*a*) Loosen captive screws (4, fig. 130) and remove plate assembly (5, fig. 130).

(*b*) Remove air conditioning filter (6, fig. 130).

(6) *Cleaning of air conditioning filter.* Clean air conditioning filter as prescribed in *a*(2) above.

(7) *Charging of air conditioning filter.* Charge air conditioning filter as prescribed in *a*(3) above.

(8) *Installation of air conditioning filter.*

(*a*) Install air conditioning filter (6, fig. 130).

(*b*) Install and secure plate assembly.

Section IV (U). OPERATOR'S SERVICE INFORMATION

Note. All procedures given in this section are to be performed with the equipment in power off condition.

184 (U). Operator's Equipment and Repair Parts

For a list of tools, equipment, and repair parts issued to the using organizations, refer to the manuals listed in paragraph 172*b*.

185 (U). Plotting Board Service Information

a. Recorder Pen Removal and Installation.

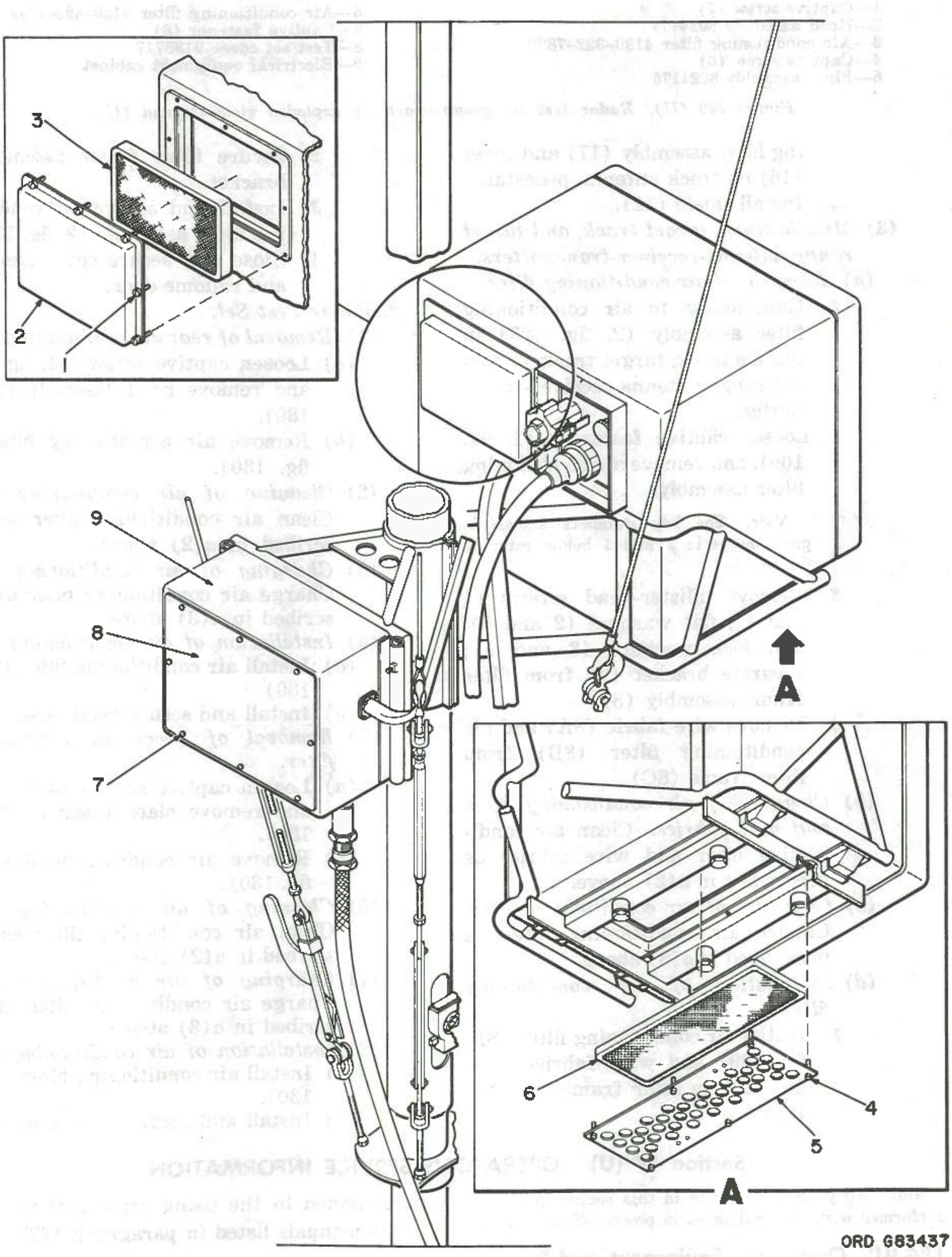


Figure 130 (U). Radar test set group—partially exploded view (U).

1—Captive screw (7)
2—Hood assembly 8024177
3—Air conditioning filter 4130-322-7800
4—Captive screw (6)
5—Plate assembly 8024175
6—Air conditioning filter 4130-322-7799
7—Captive fastener (8)
8—Test set cover 9136717
9—Electrical equipment cabinet

Figure 130 (U). Radar test set group—partially exploded view—legend (U).

ing filter assembly (17) and cover (16) on track antenna pedestal.

4. Install shield (12).

(3) *Missile track, target track, and target range antenna-receiver-transmitters.*

(*a*) *Removal of air conditioning filter.*

1. Gain access to air conditioning filter assembly (2, fig. 128) in missile track, target track, or target range antenna-receiver-transmitter.

2. Loosen captive fasteners (1, fig. 109), and remove air conditioning filter assembly.

Note. The key numbers shown in parentheses in *3* and *4* below refer to figure 129.

3. Remove fillister-head screws (1 and 4), flat washers (2 and 5), and lock washers (3 and 6); separate bracket (7) from filter frame assembly (8).

4. Remove wire fabric (8A) and air conditioning filter (8B) from filter frame (8C).

(*b*) *Cleaning of air conditioning filter and wire fabrics.* Clean air conditioning filter and wire fabrics as prescribed in *a*(2) above.

(*c*) *Charging of air conditioning filter.* Charge air conditioning filter as prescribed in *a*(3) above.

(*d*) *Installation of air conditioning filter.*

1. Install air conditioning filter (8B, fig. 129) and wire fabrics (8A, fig. 129) in filter frame (8C, fig. 129).

2. Secure filter frame assembly to bracket.

3. Install and secure air conditioning filter assembly (2, fig. 128).

4. Close and secure cover assembly and radome door.

d. Radar Test Set.

(1) *Removal of rear air conditioning filter.*

(*a*) Loosen captive screws (1, fig. 130) and remove hood assembly (2, fig. 130).

(*b*) Remove air conditioning filter (3, fig. 130).

(2) *Cleaning of air conditioning filter.* Clean air conditioning filter as prescribed in *a*(2) above.

(3) *Charging of air conditioning filter.* Charge air conditioning filter as prescribed in *a*(3) above.

(4) *Installation of air conditioning filter.*

(*a*) Install air conditioning filter (3, fig. 130).

(*b*) Install and secure hood assembly.

(5) *Removal of lower air conditioning filter.*

(*a*) Loosen captive screws (4, fig. 130) and remove plate assembly (5, fig. 130).

(*b*) Remove air conditioning filter (6, fig. 130).

(6) *Cleaning of air conditioning filter.* Clean air conditioning filter as prescribed in *a*(2) above.

(7) *Charging of air conditioning filter.* Charge air conditioning filter as prescribed in *a*(3) above.

(8) *Installation of air conditioning filter.*

(*a*) Install air conditioning filter (6, fig. 130).

(*b*) Install and secure plate assembly.

Section IV (U). OPERATOR'S SERVICE INFORMATION

Note. All procedures given in this section are to be performed with the equipment in power off condition.

184 (U). Operator's Equipment and Repair Parts

For a list of tools, equipment, and repair parts issued to the using organizations, refer to the manuals listed in paragraph 172*b*.

185 (U). Plotting Board Service Information

a. Recorder Pen Removal and Installation.

Note. When not in use, or during travel, the recorder pens are stored in the recorder pen holder located behind the altitude plotting board (8, fig. 22). The altitude plotting board and the horizontal plotting board each require one left (L) and one right (R) recorder pen.

(1) Pull out altitude plotting board release handle (12, fig. 22) and swing open altitude plotting board. Remove four recorder pens from recorder pen holder and close altitude plotting board.

(2) Install one recorder pen stamped R on the right recorder pen arm of each plotting board as prescribed in (*a*) and (*b*) below.

(*a*) Press access pushbutton and open window panel of each plotting board.

(*b*) Press pressure plate (fig. 131) against pen carrier and slide pivots on recorder pen into slots on pen carrier.

(3) Install one recorder pen stamped L on the left recorder pen arm of each plotting board as prescribed in (2) above.

(4) Fill recorder pens with ink as prescribed in *c* below.

b. Cleaning Recorder Pen.

(1) Press access pushbuttons and open window panel of each plotting board. Press pressure plate (fig. 131) against pen carrier and slide recorder pen pivots out of slots of pen carrier.

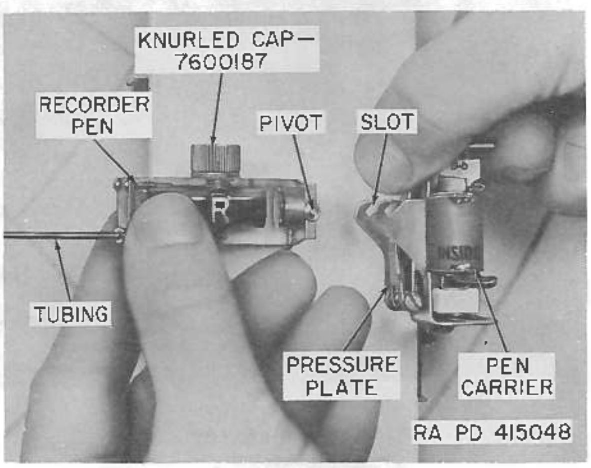


Figure 131 (U). Installing or removing recorder pen (U).

(2) Remove knurled cap from recorder pen and pour out ink.

(3) Insert one strand of cleaning brush 7606025 through tubing and move back and forth several times to clean recorder pen. Soak recorder pen in clear water or alcohol to dissolve any clogged ink.

(4) Store recorder pen, when not in use, in recorder pen holder.

c. Filling Recorder Pen.

(1) Remove knurled cap (fig. 131) on ink reservoir of the recorder pen. Fill reservoir with green plotting board ink 7601175, using battery filler syringe 7601751. Replace knurled cap.

(2) Start flow of ink in the tubing of recorder pen, when necessary, by using pen filler 7601752. To start flow of ink, press bulb on pen filler, insert end of tubing into small hole near end of pen filler, and release bulb to draw ink through tubing.

d. Replacing Plotting Board Recording Paper.

(1) Pull on knobs (fig. 132) to open paper access slot cover. Pull out and discard remaining recording paper. Pull out altitude or horizontal plotting board release handle (12 or 14, fig. 22) and open altitude or horizontal plotting board (8 or 21, fig. 22).

(2) Loosen lock and swing roller support down. Remove and discard cardboard cylinder.

(3) Obtain roll of recording paper 8008687 for altitude plotting board, or 7606013 for horizontal plotting board.

(4) Slip end or roll onto roller holder so roll of recording paper unwinds in a counterclockwise direction as viewed from the top. Position roll vertically and swing roller support into lower end of roll. Secure roller support in place with lock.

(5) Release locknut and loosen roller knob if new roll of recording paper is too long to fit into position. After roller support is fastened in place, tighten roller knob to provide slight drag as roll of recording paper is unwound. Tighten locknut.

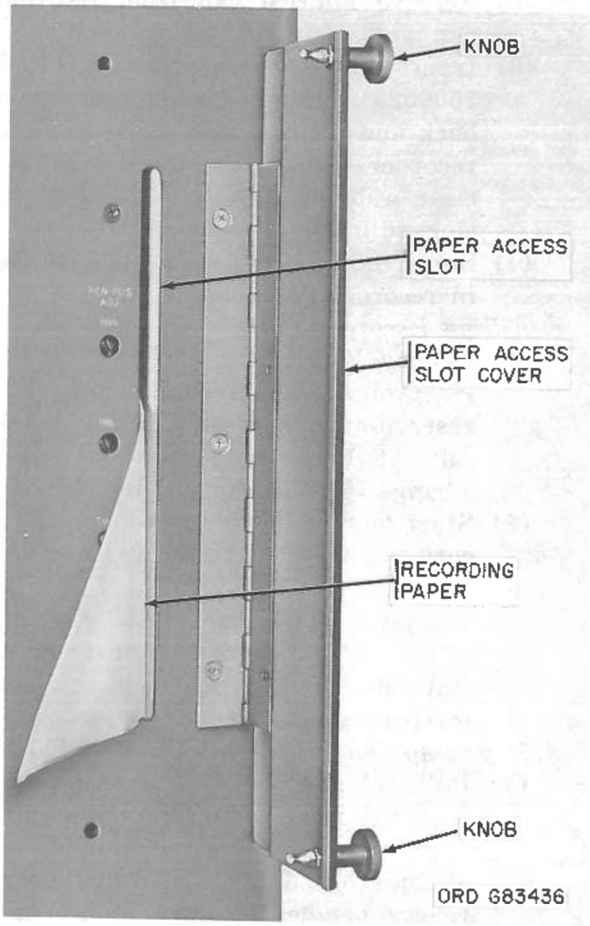


Figure 132 (U). Recording paper extending through paper access slot (U).

(6) Unroll recording paper and carefully thread paper across front of plotting surface.

Note. Fold one corner of paper to a point to facilitate threading.

(7) Push thumbscrew (2, fig. 133) to right to release roller shafts (1, fig. 133). Insert end of recording paper (3, fig. 114) between roller shafts and through paper access slot (fig. 132). Press thumbscrew down and to the left to lock roller shafts against recording paper. Pull recording paper through paper access slot until folded portion extends 6 inches outside slot.

(8) Close and latch plotting board. Close paper access slot cover over free end of recording paper. Tear off excess paper.

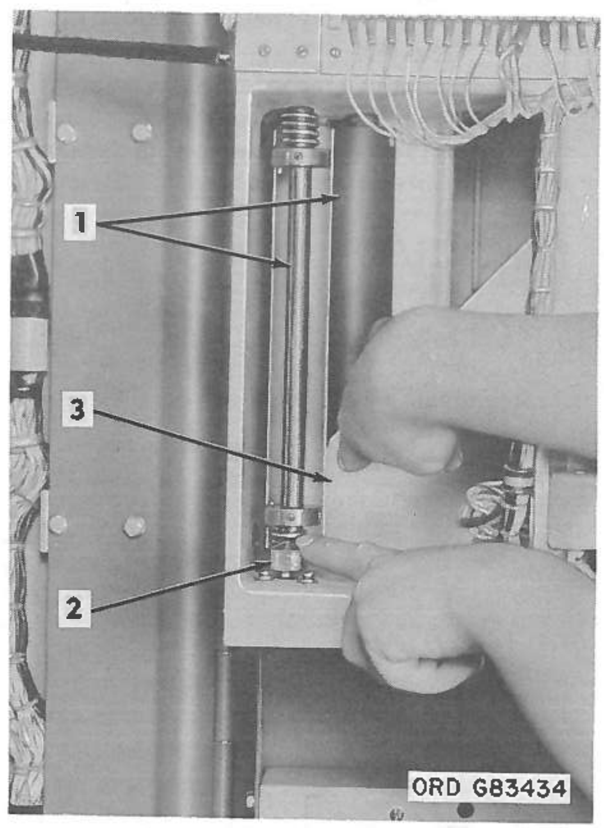
186 (U). Multichannel Data Recorder Service Information

a. Loading Recording Paper into Cylindrical Supply Drum.

(1) Obtain cylindrical supply drum (spare) (3, fig. 23) from upper left compartment of recorder group. Press drum-locking latch toward hub of drum and pull felt lips apart to open drum.

(2) Remove and discard any recording paper remaining in drum. Remove spool from inside drum.

Caution: **The recording paper is light sensitive; therefore, the loading procedure must be performed in very subdued light or in a dark room with**



1—Roller shaft (2)
2—Thumbscrew
3—Recording paper

Figure 133 (U). Threading recording paper between roller shafts (U).

an approved safe light. Make certain the backlights are off, or the recording paper may become fogged and unusable.

(3) Obtain package of recording paper and remove paper from package. Insert spool through center of roll of recording paper.

(4) Install loaded spool into drum so that paper unrolls forward from top of drum when drum is viewed with drum-locking latch on right. This insures that emulsion on recording paper is in the proper position when loaded drum is placed in multichannel data recorder.

(5) Pull approximately 6 inches of recording paper out of drum. Rotate inner shell until the felt lips are closed. Make certain the felt lips are securely closed and drum-locking latch is locked to insure a light-tight seal.

b. Loading and Unloading Multichannel Data Recorder.

(1) *Access procedure.*

(*a*) Open doors of upper left and upper right compartments (1 and 5, fig. 23) of recorder group.

(*b*) Pull down release buttons (3, fig. 51) and open cylindrical takeup drum access door.

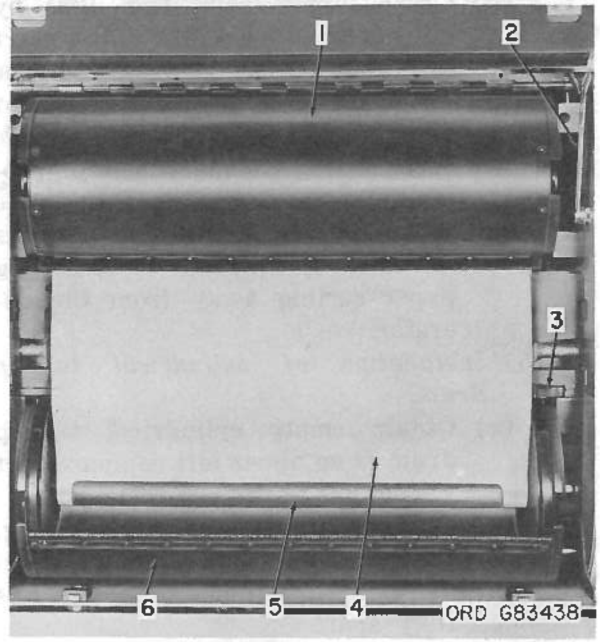
(*c*) Push latches toward center of recorder to release cylindrical supply drum access door. When latches release, lift door until retaining arm (2, fig. 134) locks door open.

(2) *Removal of loaded takeup drum.*

Caution: **Before removing takeup drum containing record, the recorder should remain energized (par. 138) for 5 minutes. This insures that the record is in the cylindrical takeup drum.**

(*a*) Push knife (3, fig. 134) from right to left to cut recording paper (4, fig. 134). The knife is springloaded and automatically returns to its original position when released.

(*b*) Place finger in notch (fig. 135) on each end of cylindrical takeup drum



1—Cylindrical supply drum
2—Retaining arm
3—Knife
4—Recording paper
5—Clamp
6—Cylindrical takeup drum

Figure 134 (U). Multichannel data recorder—partial view—loaded (U).

(6, fig. 134) and pull drum out of recorder.

(*c*) Wrap recording paper around cylindrical takeup drum.

Caution: **Do not open cylindrical takeup drum because exposure to light destroys any record on recording paper.**

(*d*) Forward takeup drum for photographic processing or record.

(3) *Removal of cylindrical supply drum.*

(*a*) Place finger in notch (fig. 135) on each side of cylindrical supply drum and lift drum out of recorder.

(*b*) Store empty supply drum in upper left compartment (1, fig. 23) of recorder group.

(4) *Installation of loaded cylindrical supply drum.*

(*a*) Check that approximately 6 inches of recording paper protrudes from supply drum as a leader.

(*b*) Grasp supply drum (fig. 135) by notches on each end of drum. Insert drum into recorder, engaging upper and lower guide pins on each end of drum in recess in plates on each side of recorder. Emulsion side of protruding recording paper should face toward inside of recorder. This is indicated by free end of recording paper curling away from the operator.

(5) *Installation of cylindrical takeup drum.*

(*a*) Obtain empty cylindrical takeup drum from upper left compartment (1, fig. 23) of the recorder group.

(*b*) Operate drum locking latch (fig. 136) on right end of empty cylindrical takeup drum and pull felt lips fully apart.

(*c*) Grasp open takeup drum by notches on each end of drum and insert drum into recorder.

(6) *Threading the recording paper.*

(*a*) Pull down recording paper (4, fig. 134) until it overlaps spool from front to back in cylindrical takeup drum.

(*b*) Press clamp (5, fig. 134) over recording paper and takeup drum spool to retain paper on spool.

(*c*) Close takeup drum. Make certain drum locking latch (fig. 136) snaps closed and felt lips lock together.

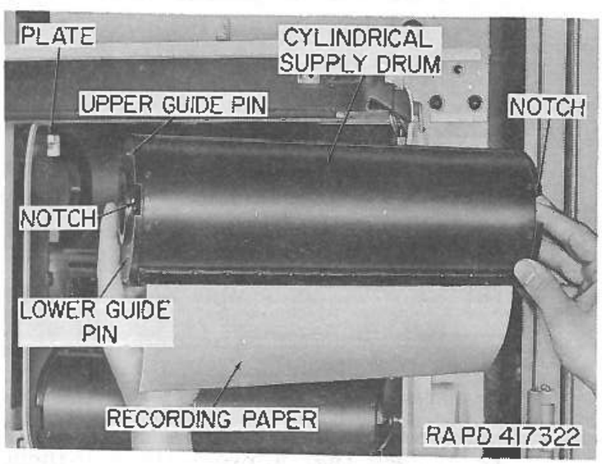


Figure 135 (U). Removing and installing cylindrical supply drum (U).

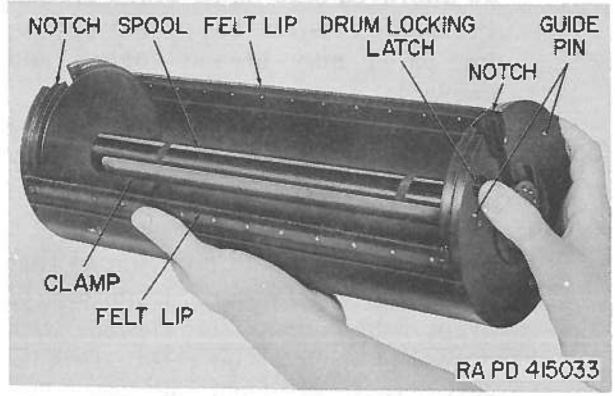


Figure 136 (U). Cylindrical drum (U).

(*d*) Press on lower portion of retaining arm (2, fig. 134) and pull cylindrical supply drum access door down to close.

(*e*) Manually set film footage counter (5, fig. 51) to indicate number of feet of recording paper in cylindrical supply drum (1, fig. 134). There are 200 feet of recording paper in a complete roll.

(7) *Checking action of cylindrical takeup drum.*

(*a*) Set OPERATE–TEST switch on multichannel data recorder to TEST.

(*b*) Set RECORD–VIEW switch on multichannel data recorder to RECORD.

(*c*) Open cylindrical takeup drum access door approximately 1 inch and feel recording paper to determine if it is feeding into takeup drum. Using flashlight, check that right end of takeup drum spindle is turning.

(*d*) Close and lock cylindrical takeup drum access door.

(*e*) Allow recording paper to feed for approximately 45 seconds to present clear paper to the recording aperture.

(*f*) Set OPERATE–TEST switch to OPERATE.

187 (U). Typical Replacement of Fuses and Lamps

a. Front panel fuse replacement procedure.

(1) Press down on bayonet cap (fig. 137)

and rotate one-quarter turn counterclockwise, or unscrew screw cap.

(2) Remove cap and defective fuse from fuse holder body.

(3) Remove defective fuse from cap and insert new fuse of correct rating.

(4) Install fuse and cap in fuse holder body.

b. Front panel lamp replacement procedure for indicator lamps.

(1) Unscrew lens (fig. 137) from indicator light body.

(2) Press down on bayonet base lamp and rotate one-quarter turn counterclockwise, or unscrew screw base lamp and remove defective lamp from indicator light body.

(3) Install new lamp of correct rating.

(4) Install lens.

c. Front panel lamp replacement procedure for switch-indicators.

(1) Remove switch-indicator until switch-indicator lens (1, fig. 138) clears chassis.

(2) Rotate switch-indicator lens 90 degrees.

(3) Remove switch-indicator from chassis.

(4) Remove filter lamp boot (6, fig. 138) from defective lamp.

(5) Press defective incandescent lamp (5,

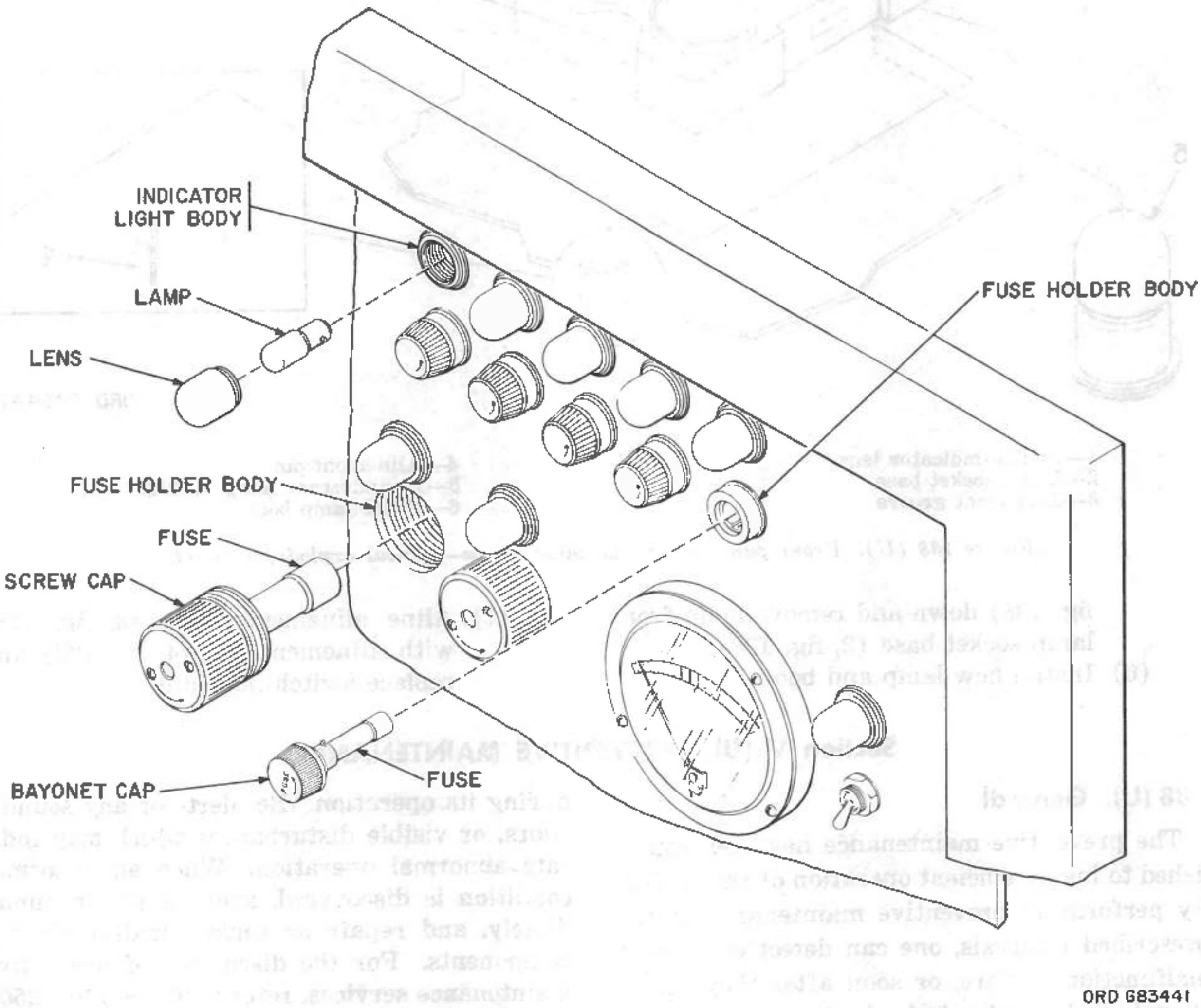
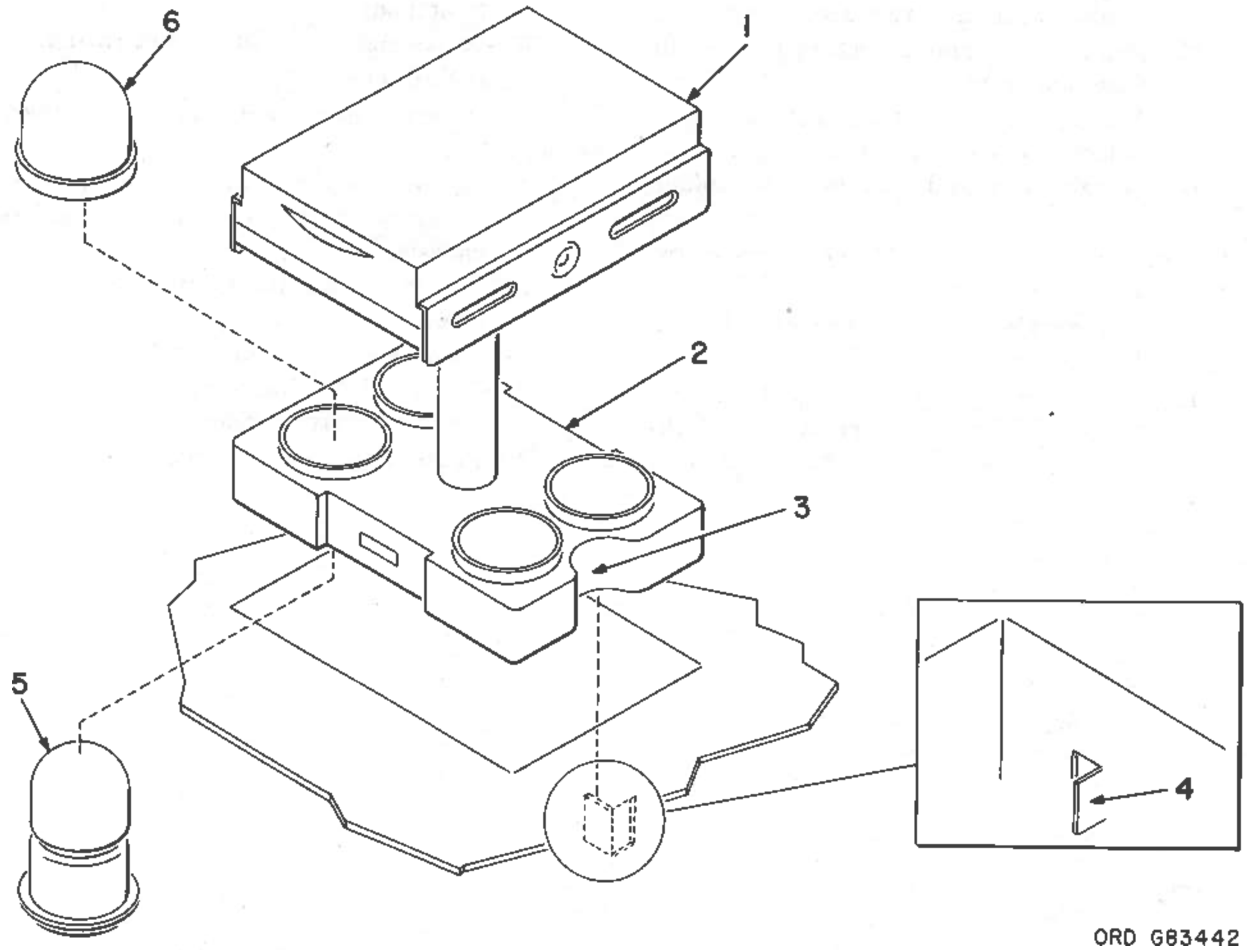


Figure 137 (U). Front panel fuses and lamps—typical exploded view (U).



1—Switch-indicator lens
2—Lamp socket base
3—Alinement groove
4—Alinement pin
5—Incandescent lamp MS25237-327
6—Filter lamp boot

Figure 138 (U). Front panel switch-indicator lamps—typical exploded view (U).

fig. 138) down and remove lamp from lamp socket base (2, fig. 138).

(6) Install new lamp and boot.

(7) Aline alinement groove (3, fig. 138) with alinement pin (4, fig. 138) and replace switch-indicator.

Section V (U). PREVENTIVE MAINTENANCE

188 (U). General

The preventive maintenance has been established to insure efficient operation of the RCDC. By performing preventive maintenance at the prescribed intervals, one can detect equipment malfunctions before, or soon after they occur. Visual and mechanical checks can be performed while the equipment is warming up and during its operation. Be alert for any sounds, odors, or visible disturbances which may indicate abnormal operation. When an abnormal condition is discovered, shut off power immediately, and repair or replace malfunctioning components. For the discussion of preventive maintenance services, refer to TM 9-1400-250-12. For maintenance of cables and V belts, refer to paragraph 189.

189 (U). Maintenance of Cables and V Belts

a. To prevent system failures due to faulty cables, observe the precautions and perform the maintenance procedures prescribed below.

(1) Clean rubber parts, connectors, and associated hardware periodically with a clean, dry cloth.

(2) If necessary, clean rubber parts with a solution of one-quarter pound soap chips to one gallon of water.

Caution: **Avoid getting petroleum products such as oil, grease, and dry-cleaning solvent on rubber parts. These products cause rapid deterioration of the rubber.**

Warning: **When using trichloroethane be sure that area is well ventilated as fumes are toxic. Rapid evaporation of trichloroethane has a drying and irritating effect on the skin. The use of gloves is advised to prevent this irritation or inflammation of the skin. If contact occurs, quickly wash the affected parts with a soap solution, rinse and dry thoroughly.**

(3) If necessary, clean cable reels and metallic portions of cables with trichloroethane 6810-664-0387.

(4) Do not drive vehicles over exposed cables.

(5) Do not bend cables in a short radius.

(6) Avoid repeated twisting and flexing of cables and do not allow them to chafe against moving objects.

(7) When cables are not in use, wind them on the reels provided and store in a cool, dark place.

(8) Do not allow dirt or moisture to collect in connectors.

(9) Protect external cable junctions by raising each junction off the ground and supporting in this position with a 4- by 4-inch wooden block.

(10) Install the covers provided on all unused connectors. Connect male and female covers when not in use to prevent accumulation of dirt.

(11) When separating connectors, grasp body of connector; never pull on cable or spring.

(12) Avoid dropping connectors into water. Exposure to water causes the insulating material around the conductors or connectors to collect dirt and moisture which eventually will cause a short or intermittent short in the cable.

(13) Never use standard cloth friction tape to tape conductors in a cable as the solvent in the tape will eventually dissolve the insulation. Use rubber or plastic tape.

(14) Maintain a small amount of insulating compound 5970-251-9149 on contacts where cable is soldered to connector to prevent collection of moisture. Avoid using excessive insulating compound which might be forced under cable jacket.

Warning: **Rubber preservative compound contains volatile flammable solvents. Use in well ventilated area and take precautions to prevent inhaling fumes. Do not expose compound to open flame. Smoking is prohibited within 10 feet of compound.**

(15) After cable has been cleaned as prescribed in (1) or (2) above, apply a coat of rubber preservative compound 8030-656-1032 to exposed portions of cable with a brush. Apply compound to replacement cables before installation if cables are not tagged indicating that compound has already been applied. Refer to TB 9-248 for further information pertaining to rubber preservative compound.

(16) Provide cable protectors and supports in accordance with TB ORD 1010.

b. The proper adjustment of V-type drive belts is necessary to avoid excessive wear, slippage, and breakage. Adjust the slack on the two V-type drive belts on the equipment cooling fan using the procedures outlined in (1) through (5) below.

(1) Loosen motor mounting bolts (fig. 138.1).

(2) Slide motor on motor mounting plate to adjust slack and tighten motor mounting bolts.

(3) Apply pressure to the drive belts and measure slack as indicated on figure 138.1.

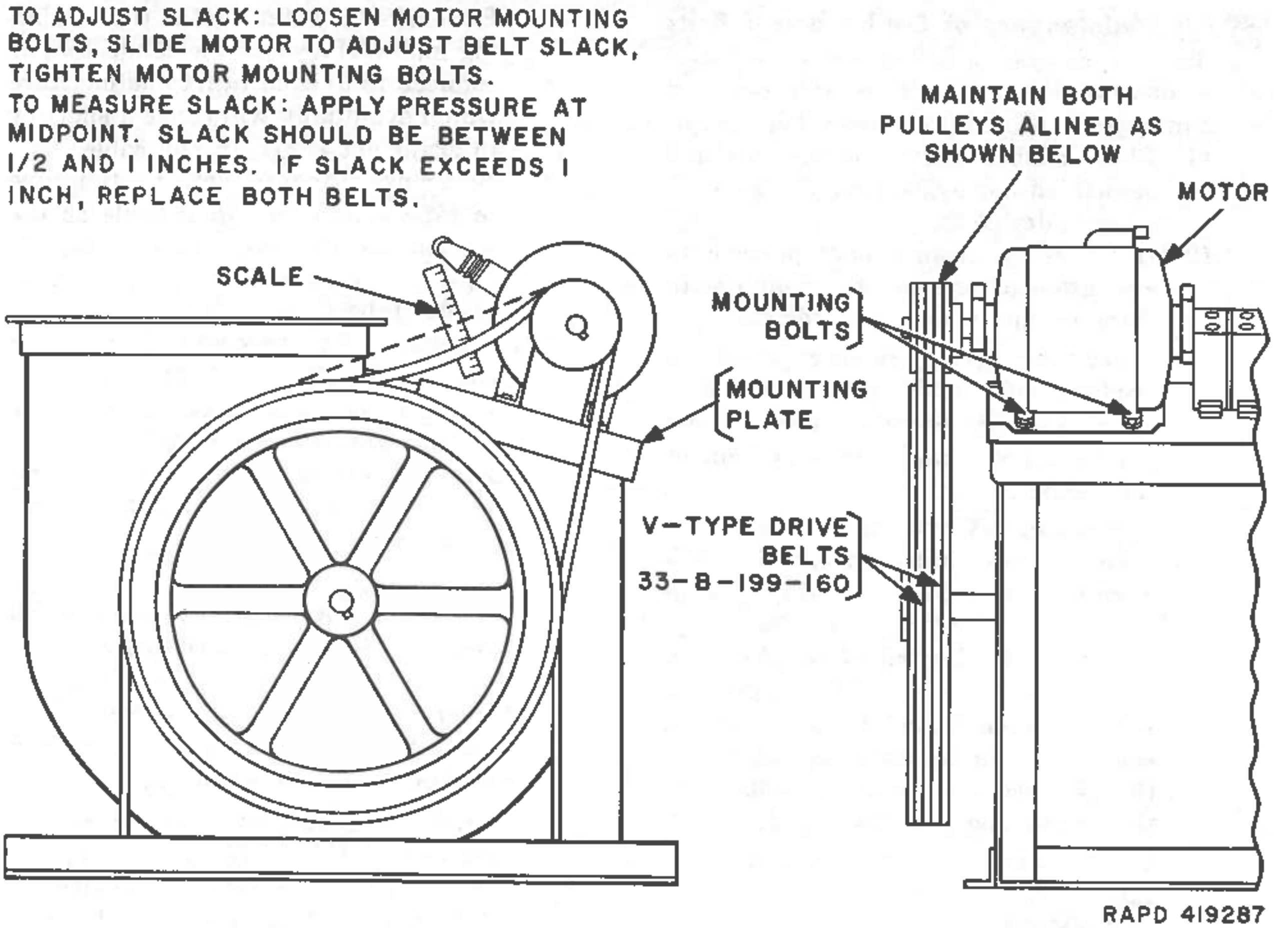


Figure 188.1 (U). Equipment cooling fan—adjustment and alinement of drive belts (U).

(4) If slack is not reduced by adjusting motor, replace both belts.

(5) Maintain motor and fan pulleys vertically alined at all times to prevent belt wear and slippage.

190 (U). General Lubrication Instructions

The lubrication charts providing lubrication instructions for the major groups of the RCDC, lubrication points, lubricants, and lubrication intervals can be found in LO 9-1430-250-20.

Section VI (U). PAINTING

191 (U). General Painting Instructions

General painting instructions are given in TM 9-213. Instructions for use of abrasive, cleaning, preserving, sealing, adhesive, and related materials which may be needed to prepare surfaces for painting are given in TM 9-247.

a. Painting Materials. Painting materials issued for use with the RCDC are listed in TM 9-1430-250-15P/21/1.

b. Precautions.

(1) Fire, poisoning, and equipment destruction hazards exist unless proper safety precautions are observed. Safety precautions associated with preparation and painting of surfaces are described in TM 9-213.

(2) When painting near electrical or electronic components or lubrication fittings, use care to keep paint off these components or fittings. Cover the components or mask them with tape

(3) Cover identification markings or mask them with tape. If these markings are

obscured during painting, they must be restored as soon as possible.

(4) Do not use steel wool to clean surfaces near exposed electrical or electronic components. Small particles of steel may fall into equipment and cause shorting or grounding of circuits.

c. Identification of Surfaces for Painting. Table 95 identifies aluminum alloy and magnesium alloy surfaces in the RCDC. Painting instructions for exterior surfaces are provided in paragraph 192.

Table 95 (U). Identification of Aluminum Alloy and Magnesium Alloy Surfaces (U)

Item	Type of material
Director station trailer:	
Interior and exterior wall and ceiling panels	Aluminum alloy
Consoles and cabinets	Magnesium alloy
LOPAR antenna-receiver-transmitter group	Magnesium alloy
Tracking station trailer:	
Interior and exterior wall and ceiling panels	Aluminum alloy
Consoles and cabinets	Magnesium alloy
Missile track, target track, and target range antenna-receiver-transmitter groups	Magnesium alloy

192 (U). Painting Exterior Aluminum Alloy and Magnesium Alloy Surfaces

Note. When two coats of paint are required, allow first coat to dry thoroughly before applying second coat.

a. Trailer Mounted Director and Tracking Stations.

(1) *Director and tracking station trailers.* Painting instructions for exterior surfaces of director and tracking station trailers are provided in TM 9-2330-212-14.

(2) *Consoles and cabinets.*

(*a*) If surface is corroded, clean with abrasive cloth 5350-271-7936, and smooth cleaned area by rubbing with aluminum oxide abrasive cloth 42-C-20350-900.

Warning: **When using trichloroethane make sure the area is well ventilated as the fumes are toxic. Rapid evaporation of trichloroethane has a drying and irritating effect on the skin. The use of gloves is advised to prevent this irritation or inflammation of the skin. If contact occurs, quickly wash the affected parts with a soap and water solution, rinse and dry thoroughly.**

(*b*) Remove oil and grease by wiping with a clean cloth moistened with trichloroethane 6810-664-0387. Change cloth frequently to avoid recontaminating surface.

(*c*) Wash surface with water and allow it to dry.

(*d*) Apply one coat of coating 8030-535-9780.

(*e*) Apply two coats of primer 8010-161-7339. Allow first coat to air dry for approximately 30 minutes before applying second coat.

(*f*) Apply two coats of lacquer 8010-324-5781.

b. Missile Track, Target Track, and Target Range Antenna-Receiver-Transmitter Groups.

(1) Prepare surface as prescribed in *a*(2) (*a*) through (*d*) above.

(2) Apply two coats of primer 8010-664-0018.

(3) Apply two coats of paint 8010-324-5786.

c. LOPAR Antenna-Receiver-Transmitter and Radar Test Set Groups.

(1) Prepare surface as prescribed in *a*(2) (*a*) through (*d*) above.

(2) Apply two coats of primer 8010-664-0018.

(3) Apply two coats of enamel 8010-297-0586.

d. Connectors.

(1) Prepare surface as prescribed in *a*(2) (*a*) through (*d*) above.

(2) Apply two coats of primer 8010-664-0018.

(3) Apply two coats of paint 8010-559-3238 (yellow), paint 8010-559-3237 (light yellow), paint 8010-559-3239

(red), paint 8010-559-3240 (orange), paint 8010-559-3143 (gray), paint 8010-297-0586 (olive drab), paint 8010-559-3138 (green), or paint 8010-559-3144 (blue), as applicable.

193 (U). Painting Interior Aluminum Alloy and Magnesium Alloy Surfaces

a. Prepare and prime surface as prescribed in paragraph 192*a*(2) (*a*) through (*e*).

b. Apply two coats of lacquer 8010-515-1598.

194 (U). Painting Cover Assembly (Radome)

***Caution:* Never paint cover assembly with metallic-base paints or primers. Metallic-base paints reduce effective radiation of antenna.**

a. Materials. The cover assembly is constructed of fiberglass and must be painted with enamel 8010-297-0586.

b. Painting Procedure.

(1) Lightly sand surface to be painted. Use abrasive paper 5350-271-7936 to remove all scale and loose paint.

(2) With a solution of soap and water, thoroughly clean area to be painted. Allow time for cover assembly to dry.

(3) Obtain the enamel specified in *a* above.

(4) Thin enamel with thinner 8010-160-5797 as required. Apply two coats of enamel with brush or spray gun. Allow first coat to harden (10 hours for spray, 12 hours for brush) and apply second coat. Do not handle for 18 hours after painting.

195 (U). Corrosion Resistant Treatment for Unpainted Aluminum Alloy and Magnesium Alloy Surfaces

a. Remove corrosion from dimensionally critical surfaces with aluminum oxide abrasive cloth 42-C-20350-900 or finer. Remove corrosion from all other surfaces with abrasive cloth 5350-271-7936 or equivalent.

b. Remove dirt, grease, and oil with cloth moistened in drycleaning solvent 6850-281-1985. Change cloth frequently to prevent recontamination of surface.

c. Apply a liberal coating of corrosion-preventive compound 8030-609-4143 to surface.

196 (U). Spot Painting Chipped Surfaces

a. Feather edges at least 2 inches beyond chipped surface.

b. Prepare surface as prescribed in paragraph 192*a*(2) (*a*) through (*d*).

c. Apply two coats of primer 8010-161-7339 (nonweather-exposed surfaces) or primer 8010-664-0018 (weather-exposed surfaces).

d. Apply two coats of paint of same type as that removed.

CHAPTER 11 (U)

ACCESS PROCEDURES AND CORRECTIVE MAINTENANCE

Section I (U). INTRODUCTION

197 (U). General

This chapter provides information to familiarize organizational maintenance personnel with methods of gaining access to the assemblies of the RCDC and with instructions for corrective maintenance of the RCDC (less HIPAR). However, these instructions do not establish the scope of maintenance which can be performed by the using organization. The scope of maintenance is determined by the allocation of repair parts, tools, and test equipment prescribed in the technical manuals listed in paragraph 172*b*.

198 (U). Scope

Section II of this chapter contains preliminary access procedures, including information on all interlocks and interlock override switches. Section III contains initial procedures for access to all cabinets, consoles, and enclosures; Section IV provides instructions for procedures beyond initial access procedures. Section V provides instructions for general corrective maintenance. Sections VI and VII contain detailed corrective maintenance procedures for repair of the major groups of the RCDC.

Note. Assemblies described in this chapter are shown in their respective cabinets, consoles, and enclosures in the locational illustrations of TM 9-1430-254-20/2, TM 9-1430-255-20, and TM 9-1430-256-20/3.

Section II (U). PRELIMINARY ACCESS PROCEDURES

199 (U). General

Preliminary procedures must be performed prior to access to the assemblies. These procedures are described in paragraph 200.

200 (U). Preliminary Procedures

a. Access procedures are provided for use during checks and adjustments, troubleshooting, preventive maintenance services, and corrective maintenance.

***Warning:* When MAIN POWER switch is set to ON, 120-volt, 3-phase power is available in cabinets, consoles, and enclosures. Avoid contact with these voltages since they may cause injury to personnel.**

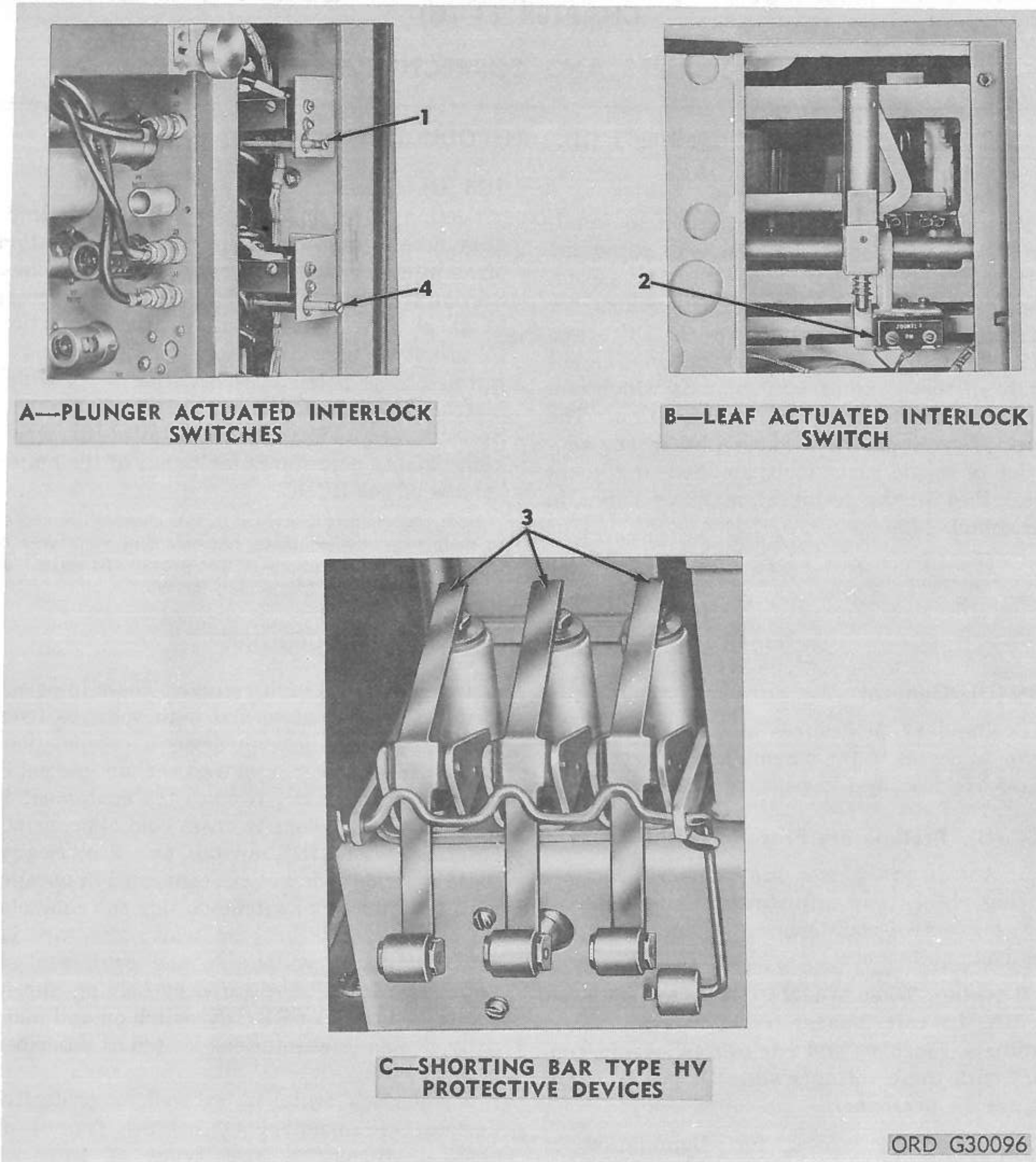
b. To provide power for illumination in trailer mounted director and tracking stations, set MAIN POWER switch on the acquisition power control panel to ON. On the trailer door light panel, lift switch guard and set BLACKOUT OVERRIDE switch to ON and set CEILING LIGHTS switch to ON.

c. Interlock switches are provided throughout the equipment as protective devices to prevent contact with high voltage. These interlock switches remove plate and high voltages from electrical assemblies whenever a cabinet door is opened, a cover removed, or an assembly frame extended. If power to the equipment is required when a door is open, hold appropriate INTLK OVERRIDE switch on. Electrically, these override switches are connected in parallel with the interlock switches inside the cabinets, consoles, or enclosures on which they are located. If plate voltage to the equipment is required, it may be restored by holding appropriate INTLK OVERRIDE switch on and manually closing local interlock switch as described in *d*(1) below.

d. Interlock switches, as well as protective devices, are mounted on cabinet frames or chassis. Generally, two types of interlock switches and one type of protective device are used. A description of each is provided below.

Note. The key numbers shown in parentheses in (1) through (3) below refer to figure 139.

(1) *Plunger actuated interlock switch.* The plunger actuated interlock switches (A) interrupt the plate volt-



1—Switch plunger (open position)
2—Spring leaf
3—Shorting bars
4—Switch plunger (manually osed position)

Figure 139 (U). Typical interlock and protective devices (U).

ages supplied to circuits within the equipment. These are the only interlock switches with a provision for manual closing. Most plunger actuated interlock switches can be manually closed by pulling the switch plunger from the open position (1) to the manually closed position (4). These interlock switches are automatically reset when the cabinet door is closed or the cover reinstalled.

(2) *Leaf actuated interlock switch.* The leaf actuated interlock switch (B) is similar to the plunger actuated interlock switch in appearance and function; however, a spring leaf (2) is used instead of a plunger. This switch has no provision for manual closing.

(3) *Protective device.* Protective devices (C) are shorting bars (3) which short high-voltage capacitors to ground when a cabinet door is opened or a cover removed. Most protective devices have no provision for manual opening.

e. Tables 96 through 102 provide information on each interlock switch and protective device in the RCDC. These tables also identify and locate the override switch associated with each interlock circuit. An override switch is provided at each of the locations listed below.

(1) Acquisition power control panel (1, fig. 25).

(2) Computer power control panel (fig. 19).

(3) Range radar power control-indicator (1, fig. 29).

(4) Radar power control-indicator (8, fig. 33).

(5) Right side of azimuth drive equipment enclosure.

(6) Right side of target track antenna support base.

(7) Right side of range antenna support base.

Table 96 (U). Interlock Switches Associated with LOPAR System (U)

Switch	Type	Location
Note. INTLK OVERRIDE switch S10 on the acquisition power control panel is provided to override interlock switches listed below, except switch S7 of director station group.		
	(Director station group)	
S1	Protective device	Acquisition HV power supply
S2	Plunger actuated	Acquisition HV power supply
S4	Plunger actuated	Left door assembly
S5	Plunger actuated	Right door assembly
S6	Plunger actuated	Acquisition power control panel
S7	Leaf actuated	Timer sliding assembly frame
S8	Plunger actuated	Left door
	(Battery control console)	
S21	Plunger actuated	Left panel assembly
S22	Plunger actuated	Left center panel assembly
S23	Plunger actuated	Right center panel assembly
S25	Plunger actuated	Right panel assembly
	(Control interconnecting group)	
S1	Plunger actuated	Upper door
S2	Plunger actuated	Upper door
S3	Plunger actuated	Center door
S4	Plunger actuated	Lower door
	(Acquisition modulator)	
S1	Plunger actuated	Modulator power supply cover
S2	Protective device	Modulator power supply cover
	(Acquisition receiver-transmitter)	
S1	Toggle	Front cover
S2	Plunger actuated	Magnetron hot box cover assembly
S3 [1]	Plunger actuated	Magnetron hot box cover assembly
S5	Plunger actuated	Acquisition RF power supply control cover assembly

[1] This interlock switch cannot be manually closed.

Table 96 (U). Interlock Switches Associated with LOPAR Systems—Continued *(U)*

Switch	Type	Location
	(Acquisition antenna pedestal)	
S3	Plunger actuated	Resolver amplifier cover assembly
S4	Plunger actuated	Relay assembly and compressor cover assembly

Table 97 (U). Interlock Switch Associated with Director-Computer Group (U)

Switch	Type	Location
	(Personnel heater)	
S3 [1]	Plunger actuated	Right door assembly

[1] This interlock switch cannot be manually closed.

Table 98 (U). Interlock Switches Associated with Computer System (U)

Switch	Type	Location
Note. INTLK OVERRIDE switch S1 on the computer power control panel is provided to override interlock switches listed below.		
	(Computer power supply group)	
S6	Plunger actuated	Computer power control panel
S7	Plunger actuated	Timer sliding assembly frame
S8	Plunger actuated	Right door assembly
	(Servo computer assembly)	
S3	Plunger actuated	Computer control-panel
S2	Plunger actuated	Right door assembly
	(Computer amplifier-relay group)	
S811	Plunger actuated	Left center door assembly
S812	Plunger actuated	Right center door assembly
	(Battery control console)	
S24	Plunger actuated	Right panel assembly
	(Recorder group)	
S2	Leaf actuated	Meter and channel control-indicator sliding assembly frame

Table 99 (U). Interlock Switches Associated with Tracking Station Group (U)

Switch	Type	Location
Note. INTLK OVERRIDE switch S2 on the radar power control-indicator is provided to override interlock switches listed below, except those in the personnel heater and TRR control. INTLK OVERRIDE switch S5 on the range radar power control-indicator is provided to override interlock switches in TRR control.		
	(Radar power supply group)	
S1	Plunger actuated	Cover assembly
S2	Plunger actuated	Radar power control-indicator
S3	Plunger actuated	Right center door assembly
S4	Plunger actuated	Lower left door assembly
S5	Plunger actuated	Lower center door assembly
S6	Plunger actuated	Lower right door assembly
	(Radar set group)	
S2	Plunger actuated	Left door assembly
S3	Plunger actuated	Target track range modulator amplifier sliding assembly frame
S4	Plunger actuated	Right door assembly
S5	Plunger actuated	Lower door assembly
	(Target radar control console)	
S11	Plunger actuated	Target antenna control group
S14	Plunger actuated	Upper left door assembly
S15	Plunger actuated	Upper center door assembly
S16	Plunger actuated	Upper right door assembly
S19 [1]	Plunger actuated	Target track indicator assembly

See footnote at end of table.

Table 99 (U). Interlock Switches Associated with Tracking Station Group—Continued *(U)*

Switch	Type	Location
(Target radar control console—Continued)		
S18 [1]	Plunger actuated	Countermeasures control-indicator
S20	Leaf actuated	Access latch assembly
S21	Plunger actuated	Lower left cover assembly
S22	Plunger actuated	Lower right cover assembly
(Missile radar control console)		
S3 [1]	Plunger actuated	Test delay simulator
S12 [1]	Plunger actuated	Missile track control drawer
S15	Plunger actuated	Upper door assembly
S16	Leaf actuated	Upper rear access release handle
S17	Leaf actuated	Lower rear access release handle
S18	Plunger actuated	Lower cover assembly
(Radar coder set)		
S1	Plunger actuated	Pulse repetition generator sliding assembly frame
S2	Plunger actuated	Battery command radar coder sliding assembly frame
S3	Plunger actuated	Radar pitch and yaw coder sliding assembly frame
S4	Plunger actuated	Coder electrical synchronizer sliding assembly frame
S5	Plunger actuated	Electrical test panel
S6	Plunger actuated	Coder control-indicator
(Target ranging radar control)		
S1	Leaf actuated	Target ranging radar timer sliding assembly frame
S2	Plunger actuated	Right door assembly
S3	Plunger actuated	Range radar power control-indicator
(Personnel heater)		
S3 [1]	Plunger actuated	Right door assembly

[1] This interlock switch cannot be manually closed.

Table 100 (U). Interlock Switches Associated with Missile Track Antenna-Receiver-Transmitter Group (U)

Switch	Type	Location
Note. INTERLOCK OVERRIDE switch S8 on the right side of the azimuth drive equipment enclosure is provided to override interlock switches listed below.		
(Azimuth drive equipment enclosure)		
S2	Plunger actuated	Left door assembly
S3	Plunger actuated	Right front door assembly
S4 [1]	Plunger actuated	Door assembly covering transformer and filter power supply subassembly
S1	Protective device	Door assembly covering rectifier power supply subassembly
S11	Plunger actuated	Door assembly covering rectifier power supply subassembly
S1 [1]	Plunger actuated	Door assembly covering track trigger amplifier
S2, S3, S4 [2]	Protective devices	Door assembly covering track trigger amplifier
(Track antenna pedestal)		
S11	Leaf actuated	Elevation lock
(Missile track receiver-transmitter)		
S9	Plunger actuated	Rear cover assembly
S2	Protective device	Lower rear cover
S5 [1]	Plunger actuated	Lower rear cover

[1] This interlock switch cannot be manually closed.
[2] These protective devices can be manually opened.

Table 101 (U). Interlock Switches Associated with Target Track Antenna-Receiver-Transmitter Group (U)

Switch	Type	Location
Note. INTERLOCK OVERRIDE switch S8 on the right side of the target track antenna support base is provided to override interlock switches listed below.		
	(Target track antenna support base)	
S2	Plunger actuated	Left door assembly
S3	Plunger actuated	Right forward door assembly
S4 [1]	Plunger actuated	Door assembly covering transformer and filter power supply subassembly
S1	Protective device	Door assembly covering rectifier power supply subassembly
S11	Plunger actuated	Door assembly covering rectifier power supply subassembly
S2, S3, S4 [2]	Protective devices	Door assembly covering target track trigger amplifier
	(Target track antenna support)	
S11	Leaf actuated	Elevation lock
	(Target track receiver-transmitter)	
S9	Plunger actuated	Rear cover assembly
S2	Protective device	Lower rear cover

[1] This interlock switch cannot be manually closed.
[2] These protective devices can be manually opened.

Table 102 (U). Interlock Switches Associated with Target Range Antenna-Receiver-Transmitter Group (U)

Switch	Type	Location
Note. INTERLOCK OVERRIDE switch S8 on the right side of the range antenna support base is provided to override interlock switches listed below.		
	(Range antenna support base)	
S3	Plunger actuated	Right forward door assembly
S2	Plunger actuated	Left door assembly
	(Range antenna pedestal)	
S11	Leaf actuated	Elevation lock
	(Range receiver-transmitter)	
S9	Plunger actuated	Rear cover assembly

Section III (U). INITIAL ACCESS PROCEDURES FOR CABINETS, CONSOLES, AND ANTENNA–RECEIVER–TRANSMITTER GROUPS

201 (U). General

Initial access to individual assemblies is gained by opening doors or removing covers. Paragraph 202 contains initial access procedures for cabinets and consoles located in the trailer mounted director and tracking stations. Paragraph 203 contains initial access procedures for the assemblies located in the missile track, target track, target range, and LOPAR antenna-receiver-transmitter groups and the radar test set group.

202 (U). Cabinets and Consoles

a. Trailer Mounted Director Station.

(1) *Battery control console.*

Note. The key numbers shown in parentheses in (*a*) through (*c*) below refer to figure 22 unless otherwise indicated.

(*a*) *Horizontal plotting board.* To gain access to horizontal plotting board (21) on the battery control console, pull horizontal plotting board release handle (14) and swing plotting board open. To open observation window assembly, depress access button.

(*b*) *Altitude plotting board.* To gain access to altitude plotting board (8) on the battery control console, pull altitude plotting board release handle (12), and swing plotting board open. To open observation window assembly, depress access button.

(c) *Battery control console (14, fig. 16).* To gain access, open six access doors.

Note. The key numbers shown in parentheses in (2) through (12) below refer to figure 16 unless otherwise indicated.

(2) *Recorder group (16).* To gain access to all compartments (1, 5, 9, and 10, fig. 23), open associated door.

(3) *Personnel heater (17).* To gain access to all compartments (2, 7, and 8, fig. 24), open associated door.

(4) *Director station group (18).* To gain access, open left and right access doors, (2, fig. 25) and acquisition power control panel (1, fig. 25).

(5) *Utility cabinet (19).* To gain access, open upper compartment top and bottom doors (1 and 10, fig. 26).

(6) *Equipment cooling cabinet (20).* To gain access, remove access door (6, fig. 26).

(7) *Auxiliary acquisition control interconnecting group (6).* To gain access to all compartments (1, 2, and 5, fig. 21), open associated door.

(8) *Early warning plotting board (5).* To gain access, pull latch on the left side of the early warning plotting board and swing plotting board open.

(9) *Battery control interconnecting box housing (7).* To gain access, raise work counter (8) and open two door assemblies.

(10) *Computer power supply group (3C).* To gain access, open computer power control panel and two lower access doors.

(11) *Servo computer assembly (3B).* To gain access, open the computer control-panel and two access doors (fig. 18).

(12) *Computer amplifier-relay group (3A).* To gain access, open four doors (5, fig. 17).

b. Trailer Mounted Tracking Station.

Note. The key numbers shown in parentheses in (1) through (9) below refer to figure 28 unless otherwise indicated.

(1) *Target radar control console (9).* To gain access, open three access doors (1, 2, and 11, fig. 32), and remove two lower panels (18, fig. 32).

(2) *Personnel heater (11).* To gain access to all compartments (2, 7, and 8, fig. 24), open associated door.

(3) *Radar power supply group (13).* To gain access open upper compartment access door (1, fig. 33), five access doors (4, 7, and 9, fig. 33), and radar power control-indicator (8, fig. 33).

(4) *Radar coder set (15).* To gain access, open two doors (3, fig. 34).

(5) *Utility Cabinet (16).* To gain access, open upper compartment top and bottom doors (1 and 10, fig. 26).

(6) *Equipment cooling cabinet (17).* To gain access, remove access door (6, fig. 26).

(7) *Radar set group (5).* To gain access, open three access doors (1, 2, and 6, fig. 31) and remove lower access door (5, fig. 31).

(8) *Missile radar control console (3).* To gain access, open upper access door (1, fig. 30), and remove panel (5, fig. 30).

(9) *Target ranging radar control (2).* To gain access, open range radar power control-indicator (1, fig. 29) and two access doors (4, fig. 29).

203 (U). Missile Track, Target Track, Target Range, and LOPAR Antenna-Receiver-Transmitter Groups and the Radar Test Set Group

The missile track, target track, target range, and LOPAR antenna-receiver-transmitter groups and the radar test set group each contain assemblies which are either stationary or mounted on swinging frames or drawer slides. Methods of gaining initial access to these assemblies are described in *a* through *c* below.

Note. Access procedures for missile track, target track, and target range antenna-receiver-transmitter groups are identical unless otherwise indicated. Therefore, only access procedures for the missile track antenna-receiver-transmitter group will be discussed.

a. Missile Track Antenna-Receiver-Transmitter Group.

(1) *Azimuth drive equipment enclosure (7, fig. 44).* To gain access, perform (*a*) and (*b*) below.

(*a*) Open and remove padlock securing each door assembly.

Warning: After opening each door assembly, release latches and check that brace assemblies are engaged to prevent accidental closing of door assemblies, which might cause injury to personnel or damage to equipment.

(*b*) Open three door assemblies.

Warning: Before working on antenna base of a tower-mounted missile track antenna-receiver-transmitter group, install guard rails on antenna support base platforms to prevent personnel from accidentally falling from platforms.

Note. The key numbers shown in parentheses in (2) below refer to figure 45 unless otherwise indicated.

(2) *Track antenna radome (8).* To gain access, perform (*a*) and (*b*) below.

Warning: Before entering track antenna radome, set ANTENNA disable switch S1 to disable (up) position and BLOWER switch S7 (5, fig. 44) to OFF to prevent possible injury to personnel.

Warning: Before working on or around track antenna pedestal, engage azimuth antirotational lock slide (2) by loosening hexagon-head bolt (3), engaging slide with track antenna pedestal (1), and tightening bolt to prevent accidental movement of pedestal, which might cause injury to personnel.

(*a*) Check that radome is depressurized.

(*b*) Open three slide fasteners (6) and radome door (4).

Note. Procedures listed in (3) below pertain to the missile track and target track antenna-receiver-transmitter groups only.

(3) *Track antenna pedestal (6, fig. 44).* To gain access, if DA MWO 9-1430-250-20/2/1 is incorporated, perform (*a*) and (*b*) below.

(*a*) Loosen latches (1, fig. 46).

(*b*) Remove antenna pedestal fairings (2, fig. 46) from each side of the track antenna pedestal (3, fig. 46).

(4) *Missile track receiver-transmitter (3, fig. 44).* To gain access, perform (*a*) through (*e*) below.

(*a*) Gain access to radome as prescribed in *a*(2) (*a*) and (*b*) above.

Warning: Before performing any maintenance within the track antenna radome, engage ELEVATION LOCK (5, fig. 45) by setting locking handle assembly to LOCK to prevent accidental movement of the missile track antenna-receiver-transmitter, which might cause injury to personnel or damage to equipment.

(*b*) Loosen knob assemblies (9, fig. 86) and release eye bolts securing cover assembly; open cover assembly.

(*c*) On the missile track and target track antenna-receiver-transmitter groups, loosen knob assemblies (5, fig. 86 or 2, fig. 88) and release eye bolts securing the track RF control-power supply group; open control-power supply group. On the target range antenna-receiver-transmitter group, open cover assembly.

(*d*) To gain access to the modulators in the missile track and target track antenna-receiver-transmitter groups, loosen knobs (6, fig. 85 or 6, fig. 87) and release eye bolts securing cover; remove cover.

(*e*) Allow cover to hang by retaining straps.

b. LOPAR Antenna-Receiver-Transmitter Group.

Warning: Before working on or around the LOPAR antenna-receiver-transmitter group, operate the ANTENNA DISABLE switch S1 to the OFF position.

Note. The key numbers shown in parentheses in (1) through (4) below refer to figure 36 unless otherwise indicated.

(1) *Acquisition antenna (1).* To gain access to hydraulic control unit or electro-mechanical control box, release catches (14) and remove cover assembly (15).

(2) *Acquisition antenna pedestal (13).*

(*a*) *Resolver amplifier.* To gain access, release captive fasteners and remove access panel (View A, fig. 39).

(*b*) *Relay assembly and compressor.* To

gain access, release captive fasteners and remove filter access cover (View B, fig. 39).

(c) *Synchro-transmitter assembly.* To gain access, release captive fasteners and remove combination access panel and filter access cover (View A, fig. 39).

(3) *Acquisition receiver-transmitter (10).*

(a) *Acquisition RF power supply control and acquisition duplexer.* To gain access, release captive fasteners and remove combination access panel and filter access cover (View A, fig. 38).

(b) *Frequency and power meter.* To gain access, release captive fasteners and remove access panel (View A, fig. 38).

(c) *Magnetron hot box.* To gain access, release captive fasteners and remove access panel (View B, fig. 38).

(d) *Right side of acquisition receiver-transmitter.* To gain access, release captive fasteners and remove filter access cover (View B, fig. 38).

(4) *Acquisition modulator (8).*

(a) *Modulator compartment.* To gain access, release captive fasteners and remove access panel (View A, fig. 37).

(b) *Rear of acquisition modulator.* To gain access, release captive fasteners and remove filter access cover (View B, fig. 37).

c. *Radar Test Set Group.*

Note. **The key numbers shown in parentheses in (1) below refer to figure 48 unless otherwise indicated.**

(1) *Radar test set (14, fig. 47).*

(a) To gain access, release latches (9) and open door assembly (6) on radar test set cabinet (8).

(b) Release canvas shields (12) from snaps (2).

(c) Remove braces (14) from clips (1) and place ends of braces in brackets (13) to support door assembly.

(d) Secure canvas shields to snaps (11) on electrical equipment drawer (7).

(2) *RF detector.* To gain access, release captive fasteners (7, fig. 130) and remove test set cover (8, fig. 130) from electrical equipment cabinet (9, fig. 130).

Section IV (U). ACCESS PROCEDURES FOR INTERNAL ASSEMBLIES

204 (U). General

The internal assemblies are those which are physically located within the major cabinets, consoles, and enclosures. Many of these assemblies are attached to the cabinet frame and are stationary, while other assemblies are either mounted on swinging frame assemblies or drawer slides, or slide on the console frames. Some assemblies are so mounted that initial access procedures make them available for servicing or repair; others require further access procedures. Paragraphs 205 through 207 give procedures for gaining access to assemblies mounted on swinging frame assemblies, sliding assembly frames, and drawer slides, and those which slide on console frames.

205 (U). Assemblies Mounted on Swinging Frame Assemblies

a. To gain access to assemblies mounted on a swinging frame assembly, loosen thumbscrew assemblies and swing frame assembly open.

Caution: **Check that frame assembly is latched in open position to prevent accidental movement and possible damage to equipment.**

b. If the electrical equipment rack is installed on the frame assembly, release captive fasteners and swing rack open.

206 (U). Assemblies Mounted on Sliding Assembly Frames and Drawer Slides

a. *Assemblies Mounted on Sliding Assembly Frames.* Sliding assembly frames are mounted either vertically or horizontally in cabinets, consoles, and enclosures. To gain access to assemblies mounted on these assembly frames, perform (1) and (2) below.

(1) Loosen thumbscrew assemblies.

(2) Extend assembly frame.

Note. Some assembly frames are equipped with a locking mechanism which secures assembly frame in extended position.

b. Assemblies Mounted on Drawer Slides.

(1) *Missile radar control console.* To gain access to assemblies mounted on drawer slides, perform (*a*) through (*c*) below.

(*a*) Turn access handles (8, fig. 30) counterclockwise, and extend missile track control drawer (9, fig. 30) on drawer sildes.

(*b*) To gain access to rear of missile radar control console, release captive fasteners and open door assembly.

(*c*) Pull upper and lower access release handles, and extend missile control-indicator group (12, fig. 30) on drawer slides.

(2) *Target radar control console.* To gain access to assemblies mounted on drawer slides, perform (*a*) and (*b*) below.

(*a*) Turn handles (23, fig. 32) counterclockwise.

(*b*) Extend target antenna control group (24, fig. 32) on drawer slides.

(3) *Radar test set.* To gain access to assemblies mounted on drawer slides, perform (*a*) through (*c*) below.

(*a*) On the rear of the radar test set, loosen captive screws.

(*b*) Loosen thumbscrew assemblies.

(*c*) Extend electrical equipment drawer on drawer slides.

207 (U). Assemblies Sliding on Console Frames

Note. The key numbers shown in parentheses in *a* below refer to figure 22.

a. Battery Control Console. To gain access to assemblies sliding on console frame, perform steps (1) through (5) below.

(1) Gain access to lower area of battery control cabinet.

(2) Turn handle (25), and withdraw IFF control-indicator (1) from cabinet.

(3) Turn handle (24), and withdraw precision indicator (15) and target designate control-indicator (16) from cabinet.

(4) Turn handle (23), and withdraw PPI (13) from cabinet.

(5) Turn handle (22), and withdraw tactical control-indicator (11) from cabinet.

b. Missile Radar Control Console. To gain access to assemblies sliding on console frame, perform (1) and (2) below.

(1) Gain access to the rear of the missile radar control console and pull lower rear access release handle.

(2) Withdraw missile track indicator, range indicator, and missile track control power supply (11, 10, and 7, fig. 30) to extended position.

Note. The key numbers shown in parentheses in *c* below refer to figure 32.

c. Target Radar Control Console. To gain access to assemblies sliding on console frame, perform (1) through (4) below.

(1) Turn access release handle (14) counterclockwise.

(2) Withdraw electric light control (25), elevation indicator (26), target track control-power supply (22), azimuth indicator (21), B scope indicator (19), target range indicator (17), and target test control (15) to extended position.

(3) Turn left release handle (7), and withdraw countermeasures control-indicator (9) to extended position.

(4) Turn right release handle (8), and withdraw target track indicator assembly (10) to extended position.

Section V (U). GENERAL CORRECTIVE MAINTENANCE PROCEDURES

208 (U). General

***Warning:* High voltage DANGEROUS TO LIFE is present throughout the equipment. When removing an electrical component, be sure all power is off before disconnecting wiring leads.**

a. Place tags on wiring leads, or otherwise identify them, before disconnecting.

b. Use a parts tray or other suitable container for storing small parts as they are removed. Keep parts in logical order to simplify reassembly. Scribe or mark parts which must be returned to their exact former position on an assembly. Never make scribe marks on screw threads or bearing surfaces.

209 (U). Checks and Adjustments Required after Corrective Maintenance

After corrective maintenance has been performed, a check or adjustment is required to insure that the replacement part or assembly and the associated electrical circuits are functioning properly. The indexes of checks and adjustments for replacement units in the major items of equipment are presented in tables 103 through 103.6.

Table 103 (U). Index of Checks and Adjustments for the Trailer Mounted Director Station (U)

Repaired component	Title of procedure	Location of procedure Table	
		TM 9-1430-251-12/1	TM 9-1430-256-12/1
Director Station Group			
Director station cabinet			
Interlock switches	Nonperiodic interlock checks		57
Transformer T1	Weekly MTI checks		28
Acquisition power control panel			
Toggle switches 8011078	Daily power checks		1
Solenoid relay 8010156	Daily power checks		1
Solenoid relay 7608169	Daily power checks		1
Rotary switch 8016523	Daily power checks		1
4-kc oscillator	Nonperiodic 4-kc-oscillator adjustments		63
	Nonperiodic 4-kc-oscillator-input adjustment		64
20–30 second delay timer	Daily power checks		1
5-minute delay timer	Daily power checks		1
±320v or +220v power supply	Daily power checks		1
+270v, −28v, and +75v or +175v power supply	Daily power checks		1
+250 or +150 volt regulator	Daily power checks		1
	Special ±250-volt-regulator balance adjustment		69
+1550v power supply	Daily power checks		1
Fast AGC amplifier	Weekly MTI checks		28
Delay line driver	Weekly MTI checks		28
Main acquisition IF amplifier	Weekly MTI checks		28
Trigger pulse-video amplifier	Weekly MTI checks		28
Electronic gate	Weekly MTI checks		28
MTI oscilloscope	Weekly MTI checks		28
MTI delay line	Weekly MTI checks		28
MTI video amplifier	Weekly MTI checks		28
Delay amplifier	Weekly MTI checks		28
Video and mark mixer	Daily receiver-sensitivity checks		8
	Weekly MTI checks		28
	Weekly video level adjustments		28.1
	Weekly PPI checks		25
	Daily SIF/IFF checks		13
	Weekly AAR orientation checks		31
Acquisition-track synchronizer	Weekly MTI checks		28
	Weekly PPI checks		25
	Daily system acquire checks		12
Acquisition Interference suppressor	Daily interference-suppressor and jam-strobe-gain checks		11

Table 103 (U). Index of Checks and Adjustments for the Trailer Mounted Director Station—Continued *(U)*

Repaired component	Title of procedure	Location of procedure Table: TM 9–1430–251–12/1	Location of procedure Table: TM 9–1430–255–12/1
Battery control console			
Battery control cabinet			
Interlock switches	Nonperiodic interlock checks		57
Horizontal plotting board			
Oil-filled variable resistors	Monthly plotting-board checks	30	
	Special plotting-board adjustments	53	
Pen-lift magnets	Monthly plotting-board checks	30	
X_{sl}, X_{sr}, Y_{sl}, and Y_{sr} motor-generators	Monthly plotting-board checks	30	
Altitude plotting board			
Oil-filled variable resistors	Monthly plotting-board checks	30	
	Special plotting-board adjustments	53	
Pen-lift magnets	Monthly plotting-board checks	30	
Differential resolver B1	Weekly AAR orientation checks		31
T_{slr}, H_{sl}, and H_{sr} motor-generators	Monthly plotting-board checks	30	
Pen limit relay assembly	Monthly plotting-board checks	30	
	Monthly dynamic checks	47	
PPI			
Cathode-ray tube	Weekly PPI checks		25
Steerable azimuth line relay	Weekly PPI checks		25
Modulation eliminator	Weekly PPI checks		25
Zero-set switch	Weekly PPI checks		25
Sweep generator	Weekly PPI checks		25
Electronic gate	Weekly PPI checks		25
PPI dc amplifier	Weekly PPI checks		25
PPI video amplifier	Weekly PPI checks		25
PPI marker generator	Weekly PPI checks		25
Precision indicator			
Cathode-ray tube	Weekly precision-indicator checks		24
Range sweep generator	Weekly precision-indicator checks		24
Azimuth sweep generator mixer stage	Weekly precision-indicator checks		24
Precision mark generator	Nonperiodic mark generator adjustments		65
Precision video amplifier	Weekly precision-indicator checks		24
Tactical control-indicator thermocouple	Weekly static initial-turn checks	14	
Target designate control-indicator			
Line slew electrical resolver	Weekly level and orientation checks		17
Motor-generator	Monthly acquisition range checks		52
Acquisition line resolver	Weekly level and orientation checks		17
Control transformer synchro	Daily system-acquire checks		12
AC generator	Monthly acquisition range checks		52
Low-power servo amplifier	Monthly acquisition range checks		52
Acquisition range generator	Monthly acquisition range checks		52
Acquisition control-indicator			
Receiver synchro	Daily antenna-coverage checks		2
STC	Weekly STC checks		30
LOPAR control-indicator			
Alarm control	Weekly AAR orientation checks		31
STC	Weekly STC checks		30

Table 103 (U). Index of Checks and Adjustments for the Trailer Mounted Director Station—Continued (U)

Repaired component	Title of procedure	Location of procedure Table	
		TM 9-1430-251-12/1	TM 9-1430-255-12/1
Computer group			
Servo computer assembly			
Computing modulators	Weekly computing-modulator balance adjustments	11	
Low-power servo amplifiers	Weekly computing-modulator balance adjustments	11	
	Weekly static steering check – gyro azimuth fixed	15	
Computer amplifier-relay group			
Initial turn control relay assembly	Monthly dynamic checks	47	
	Weekly static initial-turn checks	14	
Slew detector	Monthly earth-curvature-correction checks	37	
Computing amplifiers	Daily computing-amplifier-balance zero checks	2	
Computing modulators	Weekly computing-modulator balance adjustments	11	
Low-power servo amplifiers	Weekly computing-modulator balance adjustments	11	
Gyro azimuth line amplifier-network	Weekly gyro azimuth-transmission checks	20	
Burst error amplifier	Monthly burst-circuit checks	44	
Zero-set switches	Daily computing-amplifier-balance zero checks	2	
Zero-set amplifiers	Daily computing-amplifier-balance zero checks	2	
Gyro azimuth resolver amplifier	Weekly gyro azimuth-transmission checks	20	
Relay amplifiers	Weekly relay-amplifier balance adjustments	12	
Target ground speed amplifier	Daily static initial-turn checks	5	
Motor burn-out timer	Nonperiodic motor-burnout-timer checks	51	
Rate limiter amplifier	Monthly maneuver-nonmaneuver-multiple-target checks	48	
Computer power supply group			
±320v or +220v power supply	Daily power checks	1	
20–30 second delay timer	Daily power checks	1	
+250 volt regulator	Daily power checks	1	
−200 volt regulator	Daily power checks	1	
+270v, −28v, and +75v or +175v power supply	Daily power checks	1	
+75 volt regulator	Daily power checks	1	
Recorder group			
Multichannel data recorder			
Galvanometers	Weekly multichannel data-recorder-galvanometer zero checks	19	
	Monthly multichannel data-recorder-galvanometer calibration checks	39	
Fuse and control panel	Monthly multichannel data-recorder-galvanometer calibration checks	39	
Signal and channel relay assembly	Monthly multichannel data-recorder-galvanometer calibration checks	39	
Data switching panel	Monthly multichannel data-recorder-galvanometer calibration checks	39	
Auxiliary acquisition control interconnecting group			
Electrical resolver	Monthly MTI checks		48
Variable power transformer	Nonperiodic magnetron high-voltage supply knob-stop adjustment		60

Table 103 (U). Index of Checks and Adjustments for the Trailer Mounted Director Station—Continued *(U)*

Repaired component	Title of procedure	Location of procedure Table TM 9-1430-251-12/1	Location of procedure Table TM 9-1430-255-12/1
Main electronic frequency converter	Daily receiver-sensitivity checks		8
Auxiliary electronic frequency converter	Daily receiver-sensitivity checks		8
Electronic frequency discriminator	Daily receiver-sensitivity checks		8
Amplifier limiter	Daily receiver-sensitivity checks		8
Auxiliary acquisition control-indicator	Daily strobe-channel checks		9
Wide-band IF amplifier	Monthly AJD sensitivity checks		51
Auxiliary resolver amplifier	Weekly AAR orientation checks		31
FUIF fixed attenuator	Weekly PPI checks		25
AJD fixed attenuator	Monthly AJD sensitivity checks		51
PPI test panel	Weekly PPI checks		25
HIPAR variable attenuator	Weekly AAR orientation checks		31
Filter assembly	Weekly AAR orientation checks		31

Table 103.1 (U). Index of Checks and Adjustments for the Trailer Mounted Tracking Station (U)

Repaired component	Title of procedure	Location of procedure TM 9-1430-256-12/1 Table
Target radar control console		
Azimuth and range position amplifier	Weekly B-scope checks	[1]
Azimuth blank generator	Weekly B-scope checks	[1]
Mark generator	Weekly B-scope checks	[1]
Countermeasures control-indicator		
Countermeasures range sweep generator	Daily countermeasures control-indicator checks—TRR	22
Panoramic sweep generator	Daily countermeasures control-indicator checks—TRR	22
Countermeasures video amplifier	Daily countermeasures control-indicator checks—TRR	22
B scope indicator		
Cathode-ray tube	Weekly B-scope checks	[1]
Electronic gates	Weekly B-scope checks	[1]
B scope sweep amplifier	Weekly B-scope checks	[1]
B scope video amplifier	Weekly B-scope checks	[1]
B scope sweep generator	Weekly B-scope checks	[1]
B scope modulation eliminator	Weekly B-scope checks	[1]
B scope marker generator	Weekly B-scope checks	[1]
Azimuth, elevation, and target range indicators		
Cathode-ray tubes	Special indicator checks—MTR and TTR	125
Coarse torque receiver synchro	Special zero-setting of the coordinate indicator dials—TTR and MTR	122
Fine torque receiver synchro	Special zero-setting of the coordinate indicator dials—TTR and MTR	122
Variable resistor 7599480	Special indicator checks—MTR and TTR	125
Variable resistor 7599479	Special indicator checks—MTR and TTR	125
Variable resistor 7599478	Special indicator checks—MTR and TTR	125
Transformer 7605565	Special indicator checks—MTR and TTR	125
Unblanking amplifiers	Special indicator checks—MTR and TTR	125
Target sweep generators	Special indicator checks—MTR and TTR	125
Target video amplifiers	Special indicator checks—MTR and TTR	125

[1] Perform the procedures in table 26 in TM 9-1430-255-12/1.

Table 103.1 (U). Index of Checks and Adjustments for the Trailer Mounted Tracking Station—Continued *(U)*

Repaired component	Title of procedure	Location of procedure TM 9-1430-256-12/1 Table
Band-pass filter	Daily receiver-sensitivity checks—TTR and MTR	14
IF pre-amplifier	Daily receiver checks—TTR	11
Lin-log amplifier	Daily receiver checks—TTR	11
Target track indicator assembly		
Buzzer	Daily system-acquire checks	[2]
Target antenna control group		
Motor generators 7605334	Monthly tracking-servo checks—TTR	90
Control transformer synchros 7674821	Monthly tracking-servo checks—TTR	90
Low-power servo amplifier	Monthly tracking-servo checks—TTR	90
Target range slew control amplifier	Daily range system checks—TTR	9
Servo pre amplifier	Monthly tracking-servo checks—TTR	90
Range error detector	Daily range system checks—TTR	9
Range gate generator	Special indicator checks—MTR and TTR	125
Test adapter	Special indicator checks—MTR and TTR	125
	Daily receiver checks—TTR	11
Video time share amplifier	Special indicator checks—MTR and TTR	125
	Daily angle sensitivity checks—TTR	16
Angle modulator amplifier	Daily error-pulse-converter and angle-modulator-amplifier balance checks—TTR and MTR	15
Acquisition-track synchronizer	Daily range system checks—TTR	9
	Weekly transmitter checks—TTR	33
Missile radar control console		
Range indicator		
Unblanking amplifier	Special indicator checks—MTR and TTR	125
Track sweep generator	Special indicator checks—MTR and TTR	125
Range track video amplifier	Special indicator checks—MTR and TTR	125
Missile track indicator		
Receiver synchro	Special zero-setting of the coordinate indicator dials—TTR and MTR	122
Missile track control drawer		
Motor generators 7605334	Monthly tracking-servo checks—MTR	91
Control transformer synchros 7674821	Monthly tracking-servo checks—MTR	91
Low-power servo amplifier	Monthly tracking-servo checks—MTR	91
Servo pre amplifier	Monthly tracking-servo checks—MTR	91
Test adapter	Special indicator checks—MTR and TTR	125
	Daily AGC checks—MTR	11.1
Missile control-indicator group		
Pulse transformer	Daily radar-test set group checks	8
Motor generator	Monthly tracking-servo checks—MTR	91
Test delay simulator	Daily radar-test set group checks	8
Missile track slew control amplifier	Weekly acquire and command checks	62
AGC monitor amplifier	Weekly AGC monitor-amplifier checks—MTR	63
Angle modulator amplifier	Daily angle-sensitivity checks—MTR	17
	Weekly error-pulse-converter and angle-modulator-amplifier balance checks—TTR and MTR	47
Missile track control power supply		
Metallic rectifier	Weekly transmitter checks—MTR	35
Solenoid relay	Nonperiodic missile-track-control power supply check	110
Frequency generator	Daily command-oscilloscope checks—MTR	27
Frequency divider generator	Daily command-oscilloscope checks—MTR	27

[2] Perform the procedures in table 12 in TM 9-1430-255-12/1.

Table 103.1 (U). Index of Checks and Adjustments for the Trailer Mounted Tracking Station—Continued *(U)*

Repaired component	Title of procedure	Location of procedure TM 9-1430-256-12/1 Table
Command oscilloscope	Daily command-oscilloscope checks—MTR	27
Pulse transformer	Daily command-oscilloscope checks—MTR	27
Cathode-ray tube	Daily command-oscilloscope checks—MTR	27
Pulse generator	Daily command-oscilloscope checks—MTR	27
Combining amplifier	Daily command-oscilloscope checks—MTR	27
Pulse repetition generator	Daily command-oscilloscope checks—MTR	27
Burst generator	Daily command-oscilloscope checks—MTR	27
Yaw generator	Daily command-oscilloscope checks—MTR	27
Pitch generator	Daily command-oscilloscope checks—MTR	27
Radar power supply group		
Radar power relay assembly	Daily power checks	1
Missile rectifier relay	Daily power checks	1
Standby filament relay	Daily power checks	1
20-30 second delay timer	Daily power checks	1
5-minute delay timer	Daily power checks	1
±320v or +220v power supply	Daily power checks	1
+250 or +150 volt regulator	Daily power checks	1
−250, +250, or +150 volt regulator	Daily power checks	1
+270v, −28v, and +75v or +175v power supply	Daily power checks	1
+450v and +250v power supply	Daily power checks	1
Radar set group		
Track band pass filter	Daily angle-sensitivity checks—TTR	16
Track IF amplifier	Monthly receiver gain checks—TTR and MTR	82
	Daily receiver checks—TTR	11
	Daily AGC checks—MTR	11.1
	Monthly receiver-sensitivity checks—TTR and MTR	87
Track IF ATTENUATOR (TTR and MTR)	Monthly track IF attenuator checks—TTR and MTR	86
Track IF attenuator (MTR)	Weekly acquire and command checks	62
	Weekly AGC monitor-amplifier checks—MTR	63
IF signal divider	Daily receiver checks—TTR	11
AGC	Daily AGC checks—MTR	11.1
	Daily receiver checks—TTR	11
	Monthly track IF attenuator checks—TTR and MTR	86
Error pulse converter (TTR) or angle error detector	Daily error-pulse-converter and angle-modulator-amplifier balance checks—TTR and MTR	15
	Daily angle-sensitivity checks—TTR	16
Error pulse converter (MTR) or angle error detector	Daily error-pulse-converter and angle-modulator-amplifier balance checks—TTR and MTR	15
	Monthly angle-sensitivity checks—MTR	93
Beacon track AFC—MTR	Daily beacon-track AFC checks—MTR	13
Beacon track AFC—TTR	Nonperiodic beacon track AFC adjustment—TTR	116
Receiver gate generator	Special indicator checks—TTR and MTR	125
	Daily range system checks—TTR	9
Range error converter	Daily range system checks—MTR	10
Range error detector	Daily range system checks—TTR	9
Target test IF signal generator	Daily receiver checks—TTR	11
Test IF signal generator	Daily AGC checks—MTR	11.1

Table 103.1 (U). Index of Checks and Adjustments for the Trailer Mounted Tracking Station—Continued *(U)*

Repaired component	Title of procedure	Location of procedure TM 9-1430-256-12/1 Table
Range modulator amplifier	Daily range system checks—MTR	10
Target track range modulator amplifier	Daily range system checks—TTR	9
Target video and IF switching amplifier	Monthly receiver gain checks—TTR and MTR	82
	Daily receiver checks—TTR	11
	Daily beacon-track AFC checks—TTR	12
Missile video and IF switching amplifier	Monthly receiver gain checks—TTR and MTR	82
	Daily AGC checks—MTR	11.1
	Daily beacon-track AFC checks—MTR	13
Target range amplifier-control group		
Target range mark generator	Daily range system checks—TTR	9
	Weekly B-scope checks	[3]
Track range amplifier-control group		
Synchro transmitters 7674818	Special zero-setting of the coordinate indicator dials—TTR and MTR	122
	Daily range system checks—MTR	10
	Monthly tracking-servo checks—MTR	91
Motor generator	Daily range system checks—MTR	10
	Monthly tracking-servo checks—MTR	91
AC motor	Daily range system checks—MTR	10
	Monthly tracking-servo checks—MTR	91
Range mark generator	Daily range system checks—MTR	10
Range position transmitter	Special zero-setting of the position and correction transmitters—TTR, MTR,and TRR	121
	Special zero-setting of the coordinate indicator dials—TTR and MTR	122
	Daily range system checks—TTR	9
	Daily range system checks—MTR	10
	Daily orientation checks—TTR and MTR	25
Timing wave amplifier-oscillator	Daily range system checks—TTR	9
	Daily range system checks—MTR	10
Range calibrator generator	Daily range system checks—TTR	9
Launcher position control	Weekly acquire and command checks	62
Target ranging radar control		
Band-pass filter	Daily lin-log receiver checks—TRR	19
	Daily receiver-sensitivity checks—TRR	20
IF pre-amplifier	Daily lin-log receiver checks—TRR	19
	Daily receiver-sensitivity checks—TRR	20
Lin-log amplifier	Daily lin-log receiver checks—TRR	19
	Daily receiver-sensitivity checks—TRR	20
Range video detector	Daily countermeasures control-indicator checks—TRR	22
Target range synchronizer	Weekly parallax-correction checks—TRR	59
	Weekly transmitter checks—TRR	34
	Daily range-zero checks—TRR	21
Panoramic video detector	Daily countermeasures control-indicator checks—TRR	22
20–30 second delay timer	Daily power checks	1
5-minute delay timer	Daily power checks	1
±320v or +220v power supply	Daily power checks	1
−250, +250, or +150 volt regulator	Daily power checks	1
+250 or +150 volt regulator	Daily power checks	1
Target test IF signal generator	Daily lin-log receiver checks—TRR	19
Radar coder set		
Relays 9001042	Monthly radar-coder checks—MTR	103

[3] Perform the procedures in table 26 in TM 9-1430-255-12/1.

Table 103.2 (U). Index of Checks and Adjustments for the Missile Track Antenna-Receiver-Transmitter Group (U)

Repaired component	Title of procedure	Location of procedure in TM 9-1430-256-12/1 Table
Missile track antenna-receiver-transmitter		
Transformer and filter power supply, subassembly	Weekly transmitter checks—MTR	35
Rectifier power supply subassembly	Weekly transmitter checks—MTR	35
+350v power supply	Weekly transmitter checks—MTR	35
High-power servo amplifier	Monthly high-power servo-amplifier checks—TTR, MTR, and TRR	75
Missile track receiver-transmitter		
Electron tube 8019161	Weekly transmitter checks—MTR	35
Magnetron tuning drive	Nonperiodic transmitter-frequency checks—MTR	113
	Daily MTR transmitter-frequency checks	7
Magnetron electron tube	Weekly transmitter checks—MTR	35
	Monthly pressurization and dehumidification checks—TTR, MTR, and TRR	66
−500v bias power supply	Weekly transmitter checks—MTR	35
Missile track receiver-transmitter subassembly		
Track amplifier-converter		
Crystal units (diode semi-conductor devices)	Monthly receiver-sensitivity checks—TTR and MTR	87
IF pre amplifier	Monthly receiver-sensitivity checks—TTR and MTR	87
Sum IF pre amplifier	Monthly receiver-sensitivity checks—TTR and MTR	87
Tuned cavity	Nonperiodic transmitter-frequency checks—MTR	113
	Daily MTR transmitter-frequency checks	7
Track RF control power supply group		
Skin track AFC	Nonperiodic skin-track AFC checks—MTR	118
Frequency-error converter	Nonperiodic transmitter-frequency checks—MTR	113
	Daily MTR transmitter-frequency checks	7
Power monitor	Nonperiodic power-monitor adjustments—TTR, MTR, and TRR	117
	Weekly transmitter checks—MTR	35
+2v power supply	Weekly transmitter checks—MTR	35
Track RF control-power supply	Weekly transmitter checks—MTR	35
Track trigger amplifier	Weekly transmitter checks—MTR	35
Track antenna pedestal		
Transmitter synchro	Special zero-setting of the coordinate indicator dials—TTR and MTR	122
Azimuth drive equipment enclosure		
Transmitter synchro	Special zero-setting of the coordinate indicator dials—TTR and MTR	122

Table 103.3 (U). Index of Checks and Adjustments for the Target Track Antenna-Receiver-Transmitter Group (U)

Repaired component	Title of procedure	Location of procedure in TM 9-1430-256-12/1 Table
Target track antenna-receiver-transmitter		
Target track trigger amplifier	Weekly transmitter checks—TTR	33
−500v power supply	Weekly transmitter checks—TTR	33
+2500v and +5000v power supply	Weekly transmitter checks—TTR	33
Electron tube 8019161	Weekly transmitter checks—TTR	33

Table 103.3 (U). Index of Checks and Adjustments for the Target Track Antenna-Receiver-Transmitter Group—Continued *(U)*

Repaired component	Title of procedure	Location of procedure in TM 9-1430-256-12/1 Table
Transformer and filter power supply subassembly	Weekly transmitter checks—TTR	33
Rectifier power supply subassembly	Weekly transmitter checks—TTR	33
+350v power supply	Weekly transmitter checks—TTR	33
High-power servo amplifier	Monthly high-power servo-amplifier checks—TTR, MTR, and TRR	75
Target track receiver-transmitter		
Magnetron tuning drive	Special Magnetron-tuning-drive-torque checks—TTR	123
	Weekly transmitter checks—TTR	33
Magnetron electron tube	Weekly transmitter checks—TTR	33
—500v bias power supply	Weekly transmitter checks—TTR	33
Receiver-transmitter radar subassembly		
Target track amplifier-converter		
Target IF pre amplifier	Monthly receiver-sensitivity checks—TTR and MTR	87
Target track sum IF pre amplifier	Monthly receiver-sensitivity checks—TTR and MTR	87
Crystal units (diode semi-conductor device)	Monthly receiver-sensitivity checks—TTR and MTR	87
Waveguide shutter assemblies	Monthly receiver-sensitivity checks—TTR and MTR	87
Electrical solenoid	Monthly receiver-sensitivity checks—TTR and MTR	87
Target track monopulse duplexer	Monthly pressurization and dehumidifier checks—TTR, MTR and TRR	66
	Weekly collimation checks—TTR and MTR	56
	Special reflector-tilt checks—TTR and MTR	127
Electron tubes 8175708	Monthly receiver-sensitivity checks—TTR and MTR	87
Electron tubes 8175707	Monthly receiver-sensitivity checks—TTR and MTR	87
Target track RF control-power supply group		
Target track AFC	Nonperiodic target-track AFC adjustments—TTR	111
Target track RF control-power supply	Weekly transmitter checks—TTR	33
Power monitor	Nonperiodic power-monitor adjustments—TTR, MTR, and TRR	117
	Weekly transmitter checks—TTR	33
Target track antenna-support group		
Target track antenna support base		
Transmitter synchro	Special zero-setting of the coordinate indicator dials—TTR and MTR	122

Table 103.4 (U). Index of Checks and Adjustments for the Target Range Antenna-Receiver-Transmitter Group (U)

Repaired component	Title of procedure	Location of procedure in TM 9-1430-256-12/1 Table
Target range antenna-receiver-transmitter		
—250v reference power supply	Weekly transmitter checks—TRR	34

Table 103.4 (U). Index of Checks and Adjustments for the Target Range Antenna-Receiver-Transmitter Group—Continued *(U)*

Repaired component	Title of procedure	Location of procedure in TM 9-1430-256-12/1 Table
High-power servo amplifier	Monthly high-power servo-amplifier checks—TTR, MTR, and TRR	75
Antenna control computer		
Servo pre amplifier	Weekly parallax-correction checks—TRR	59
Computing amplifier	Weekly parallax-correction checks—TRR	59
Computing amplifier control	Weekly parallax-correction checks—TRR	59
Range receiver-transmitter		
Range pulse generator	Weekly transmitter checks—TRR	34
Receiver-transmitter subassembly		
Left RF oscillator	Weekly transmitter checks—TRR	34
	Nonperiodic AFC checks—TRR	112
	Daily receiver-sensitivity checks—TRR	20
	Daily countermeasures control-indicator checks—TRR	22
Right RF oscillator	Weekly transmitter checks—TRR	34
	Nonperiodic AFC checks—TRR	112
	Daily receiver-sensitivity checks—TRR	20
	Daily countermeasures control-indicator checks—TRR	22
Center RF oscillator	Weekly transmitter checks—TRR	34
	Nonperiodic AFC checks—TRR	112
	Daily receiver-sensitivity checks—TRR	20
	Daily countermeasures control-indicator checks—TRR	22
Electron tubes 9141022	Weekly transmitter checks—TRR	34
Range A frequency mixer stage	Weekly AFC checks—TRR	37
	Daily countermeasures control-indicator checks—TRR	22
Panoramic frequency mixer stage	Weekly AFC checks—TRR	37
	Daily countermeasures control-indicator checks—TRR	22
Range B frequency mixer stage	Weekly AFC checks—TRR	37
	Daily countermeasures control-indicator checks—TRR	22
Range IF pre amplifier	Daily receiver-sensitivity checks—TRR	20
AFC IF pre amplifier	Weekly AFC checks—TRR	37
DC amplifier	Weekly transmitter checks—TRR	34
Magnetron tuning drive	Weekly transmitter checks—TRR	34
	Daily countermeasures control-indicator checks—TRR	22
Panoramic directional coupler	Daily countermeasures control-indicator checks—TRR	22
Range RF control-power supply group		
AFC	Nonperiodic AFC checks—TRR	112
	Daily countermeasures control-indicator checks—TRR	22
Meter control-indicator	Weekly transmitter checks—TRR	34
Panoramic control	Daily countermeasures control-indicator checks—TRR	22
RF power test set	Nonperiodic power-monitor adjustments—TTR, MTR, and TRR	117
	Weekly transmitter checks—TRR	34

Table 103.5 (U). Index of Checks and Adjustments for the LOPAR Antenna-Receiver-Transmitter Group (U)

Repaired component	Title of procedure	Location of procedure in TM 9-1430-255-12/1 Table
Acquisition antenna pedestal		
Resolver amplifier	Nonperiodic 4-kc-oscillator adjustments	63
	Nonperiodic 4-kc-oscillator-input adjustment	64
	Weekly PPI checks	25
Compressor	Monthly pressurization and dehumidifier checks	37
Dehumidifier	Monthly pressurization and dehumidifier checks	37
Acquisition modulator		
Interlock switches	Nonperiodic interlock checks	57
DC power filters 7605562	Weekly antenna voltage, current, and AFC checks	19
	Weekly transmitter-frequency and power checks	21
Acquisition modulator power supply		
Acquisition pulse generator assembly		
Acquisition trigger amplifier	Weekly antenna voltage, current, and AFC checks	19
Modulator power supply	Weekly antenna voltage, current, and AFC checks	19
Modulator control-indicator	Weekly antenna voltage, current, and AFC checks	19
Acquisition receiver-transmitter	Weekly antenna voltage, current, and AFC checks	19
Transformer	Weekly transmitter-frequency and power checks	21
Magnetron electron tube 7599353	Weekly transmitter-frequency and power checks	21
Receiver tuner	Weekly antenna voltage, current, and AFC checks	19
Noise generators	Monthly receiver-sensitivity check	42
Acquisition duplexer		
Magnetic circuit	Nonperiodic traveling-wave-tube adjustment	61
	Monthly receiver-sensitivity check	42
Acquisition IF preamplifier	Monthly receiver-sensitivity check	42
	Weekly antenna voltage, current, and AFC checks	19
Acquisition AFC	Weekly antenna voltage, current, and AFC checks	19
Low-power servo amplifier	Weekly antenna voltage, current, and AFC checks	19
Acquisition RF power supply control		
Variable resistors 7622442	Nonperiodic traveling-wave-tube adjustment	61
Transformers 8516189	Weekly antenna voltage, current, and AFC checks	19
	Nonperiodic traveling-wave-tube adjustment	61
Transformer 7605355	Nonperiodic traveling-wave-tube adjustment	61
	Monthly receiver-sensitivity check	42
Amplifier-relay assembly	Daily strobe-channel checks	9

Table 103.6 (U). Index of Checks and Adjustments for the Radar-Test-Set Group (U)

Repaired component	Title of procedure	Location of procedure Table TM 9-1430-256-12/1
Radar test set		
Low-power servo amplifier	Daily radar-test-set group checks	8
Radar test set power supply	Daily radar-test-set group checks	8
Radar test set pulse generator	Daily radar-test-set group checks	8
Target oscillator	Daily radar-test-set group checks	8
Control transformer synchro	Daily radar-test-set group checks	8
Klystron electron tube 7676496	Daily radar-test-set group checks	8
Missile oscillator	Daily radar-test-set group checks	8
Klystron electron tube 7676496	Daily radar-test-set group checks	8
RF detector		
Diode semiconductor device	Daily collimation checks—TRR	24

210 (U). Soldering and Insulating

***Warning:* Overheating Teflon material creates toxic vapors that are extremely dangerous if inhaled. Use care to avoid overheating Teflon while soldering. Solder only in adequately ventilated areas. Do not carry cigarettes or tobacco into areas where they may become contaminated. Wash Teflon from hands before smoking. An overload condition in a circuit may cause Teflon to overheat. Afflicted personnel may have a reaction similar to influenza such as chills, body aches, coughing, and nausea. To protect against respiratory complications, carry, do not walk, afflicted personnel to a hospital for treatment.**

a. Preparing Joint for Soldering.

(1) Carefully clean surfaces to be soldered by removing all dirt, grease, or corrosion.

(2) Make joint mechanically tight by wrapping wire at least once, but not more than twice, around lug or connector.

b. Soldering Joint.

(1) Clamp short round-nose pliers, or connect alligator clip, near joint to conduct excess heat away from component.

(2) Heat joint until solder flows smoothly to prevent a cold solder joint. Use only enough solder to fill joint completely. Remove excess solder.

(3) Allow joint to cool and test for tightness.

c. Insulating. Properly insulate all wires, making sure that bare wires are taped. To prevent wear, fraying, or burning of wire, shielding, or insulation, be sure that vinyl insulation sleeving covers any wire that could contact metal parts or components.

211 (U). Wiring Electronic Components

a. Make terminal connections so that tops of terminals are free for connection of test leads.

b. Give every lead from a component a slight bend of approximately one-eighth inch from body of component. Allow additional slack (slight curve in lead) for expansion and contraction.

c. Install and wire replacement components exactly as they were originally.

212 (U). Removal and Installation of Electronic Chassis

a. General. Electronic chassis which are electrically and mechanically identical may be used interchangeably throughout the equipment. All electronic chassis in the RCDC are shown in the locational diagrams in TM 9-1430-254-20/2, TM 9-1430-255-20, and TM 9-1430-256-20/3. General instructions applicable to the replacement of all electronic chassis are given in *b* and *c* below.

b. Removal.

(1) Gain access to chassis.

(2) Disconnect connectors and any wiring connected to terminal boards.

(3) Loosen or remove attaching hardware, as applicable, and remove chassis.

c. Installation.

(1) Install chassis, and secure with attaching hardware.

(2) Connect connectors, and connect wiring to terminal boards.

(3) Secure sliding assembly frames, close door assemblies, and install covers, as applicable.

213 (U). Handling and Replacement of Electron Tubes

a. General. Procedures for replacing electron tubes which require special tools or techniques are given in the corrective maintenance instructions for the associated equipment. Replacement of miniature and octal-base tubes is described in *e* and *f* below.

b. Interchangeable Electron Tubes. Table 104 lists the electron tubes in the RCDC which have been superseded by ruggedized tubes. These tubes are interchangeable; however, use of the ruggedized tubes is preferred.

c. Determining Condition of Electron Tubes.

(1) Electron tube test set 1430-511-9358 is provided for testing electron tubes.

(2) In normally operating mercury vapor rectifier tubes, the gas ionizes and glows with a light blue color. If tube does not glow or glow is pink, remove tube, invert it, and shake it vigorously a few times. If pink color persists when tube is reinstalled, replace tube.

(3) Normally operating hydrogen-filled tubes have a steady green-blue glow. If glow flickers or is intermittent, remove and test tube.

Table 104 (U). Interchangeable Electron Tubes (U)

Superseded tube	Preferred ruggedized tube
OA2	OA2WA
OB2	OB2WA
2C51	5670
2D21W	5727/2D21W
3B24W	3B24WA
3C45	6130
5R4GY	5R4WGA
5R4WGY	5R4WGA
6AK5	6AK5WB
6AL5	5726/6AL5W
6AN5	6AN5WA
6AQ5	6005/6AQ5
6AR5	6384
6AS7G	6080WA
6AU6	6AU6WB
12AU7	5814A
5651	5651WA
5687	5687WA
7208A	7208B

d. Radioactive Electron Tubes.

Warning: **Radioactive material contained in radioactive electron tubes is harmful. Be extremely careful to prevent breaking these tubes.**

(1) Some electron tubes used in the RCDC contain radioactive materials. The types and identifying numbers of these tubes are given at the beginning of this manual.

Warning: **Avoid breathing vapors released from broken or cracked tubes.**

Warning: **Do not burn radioactive tubes, debris, or items used in handling radioactive material.**

(2) Dispose of all radioactive tubes or debris in accordance with AR 755-380.

(3) The amount of radioactivity emitted by each tube is so minute that even when tubes are stored together there is no danger to personnel in the immediate vicinity. A safety hazard does exist if a tube is broken. If breakage occurs, observe precautions prescribed in (*a*) through (*f*) below.

(*a*) Isolate area.

(*b*) Wear protective gloves when picking up broken pieces of tube or when handling cracked tubes. Clean contaminated area by wiping with wet cloth. Make one stroke at a time. After each stroke, fold the cloth in half with the clean side out. When clean area of cloth becomes too small, obtain a clean piece of cloth. Do not wipe with back and forth motion; this rubs radioactive material into surface being cleaned.

(*c*) Dispose of all broken tube pieces and cleaning cloths in accordance with AR 755–380.

(*d*) Wash hands immediately after handling contaminated objects. Report to doctor at once if skin has been broken or cut.

(*e*) Wash any contaminated clothing thoroughly before wearing again.

(*f*) Wash any equipment or tools used in handling radioactive material with soap and water; rinse with clean water.

(*g*) Refer to TB ORD 648 for additional information.

Warning: **Be sure that all electrical power is off when replacing electron tubes. Voltage which may injure personnel is applied to some tube shields.**

e. Replacement of Miniature Electron Tubes.

(1) *Removal.*

(*a*) If tube shield is installed, remove by depressing slightly and rotating the tube approximately 45 degrees counterclockwise.

(*b*) If tube is secured by a clamp, release clamp and remove tube.

(*c*) If tube is too hot to remove by hand, use electron tube extractor 7620765 (5120–293–2840).

(2) *Installation.*

(*a*) If necessary, straighten pins by inserting tube into miniature electron tube pin straightener. Refer to table 105 for locations of pin straighteners.

(*b*) Aline tube pins with holes in tube socket, and press tube firmly into position.

(*c*) If applicable, secure tube with tube clamp or install tube shield.

f. Replacement of Octal-Base Electron Tubes.

(1) *Removal.*

(*a*) If cap connector is attached, disconnect it.

(*b*) If tube shield is installed, remove by depressing the tube slightly and rotating it approximately 45 degrees counterclockwise.

(*c*) If tube is secured by clamp, release clamp and remove tube.

Table 105 (U). Location of Electron Tube Pin Straighteners (U)

Cabinet assembly	Location	Quantity
Computer amplifier-relay cabinet	Upper left front corner of swinging frame assemblies	4
Director station cabinet	Top of lower crosspiece behind acquisition power control panel	2
Computer power cabinet	Top of upper sliding assembly frame support crosspiece behind computer power control panel	2
Radar coder set cabinet	Front of sliding assembly frame support crosspiece	2
Radar power supply cabinet	Spare fuse panel on sliding assembly frame in compartment to left of radar power control-indicator	2
Target ranging radar control cabinet	Top of lower crosspiece behind range radar power control-indicator	2
Track RF control-power supply group	Lower left corner of track RF control-power supply group frame	2
Target track RF control-power supply group	Lower left corner of target track RF control-power supply group frame	2
Acquisition receiver-transmitter	Next to magnetron tuning drive motor	2
Radar test set	Left side of test set subassembly frame	2

(2) *Installation.*

(*a*) Aline tube pins with holes in tube socket and press tube firmly into position.

(*b*) If applicable, secure tube with tube clamp or tube shield.

(*c*) If applicable, connect cap connector.

213.1 (U). Removal and Installation of Magnetrons

Warning: **Voltages DANGEROUS TO LIFE are associated with the magnetron. Make certain the associated power switch is set to off and the antenna is disabled. All components near the magnetron which may contain high voltage should be discharged to ground.**

Caution: **Meters and switches will be damaged by the strong magnetic field if they are brought near the magnetron. Keep magnetron away from ferrous metals and dirty surfaces.**

a. Removal of LOPAR Magnetron.

(1) Gain access to corona shield compartment and remove corona shield (13, fig. 139.1).

(2) Unscrew externally relieved body screw (8, fig. 139.1) and disconnect electrical lead with clip (6, fig. 139.1) from magnetron cathode (16, fig. 139.1).

(3) Gain access to magnetron compartment.

Note. The key numbers shown in parentheses in (4) through (11) below refer to figure 139.2.

(4) Loosen knurled knob (10) and remove hose coupling (6).

(5) Loosen two setscrews (14) and disconnect flexible shaft (12) from the magnetron dial (15).

(6) Loosen four thumbscrews (1) and four fillister-head screws (2) on knurled adapter ring (3).

(7) Turn knurled adapter ring counterclockwise and position knurled adapter ring clear of magnetron tube (4).

(8) Loosen two knurled locking screws (5).

(9) Operate the two latches (16) to compress the blower housing (17) and provide clearance between the magnetron and the blower.

(10) Turn and hold left RELEASE knob (8) clockwise, right RELEASE knob (8) counterclockwise, and pull magnetron carriage (13) to full forward position.

(11) Loosen two externally relieved body screws (9) to loosen electrical clamps (7). Slide clamps forward and remove magnetron.

Warning: **Handle magnetron by magnets only. Force applied to other parts may cause damage to equipment or injury to personnel.**

b. Installation of LOPAR Magnetron.

Note. The key numbers shown in parentheses in (1) through (10) below refer to figure 139.2 unless otherwise indicated.

(1) Position replacement magnetron tube on magnetron carriage (13) and secure against carriage stop.

(2) Position and finger tighten electrical clamps (7) to secure magnetron on carriage.

(3) Slide magnetron carriage in position. Secure RELEASE knobs (8) and position magnetron tube under knurled adapter ring (3).

Caution: **Screw the adapter ring to the magnetron only tight enough so that angular distortion of the flexible section is avoided. It may be necessary to loosen or tighten the knurled adapter ring one-half turn in either direction to obtain a positive clamping without distorting the flexible waveguide section.**

(4) Operate the two latches (16) to expand the blower housing (17) to its normal position.

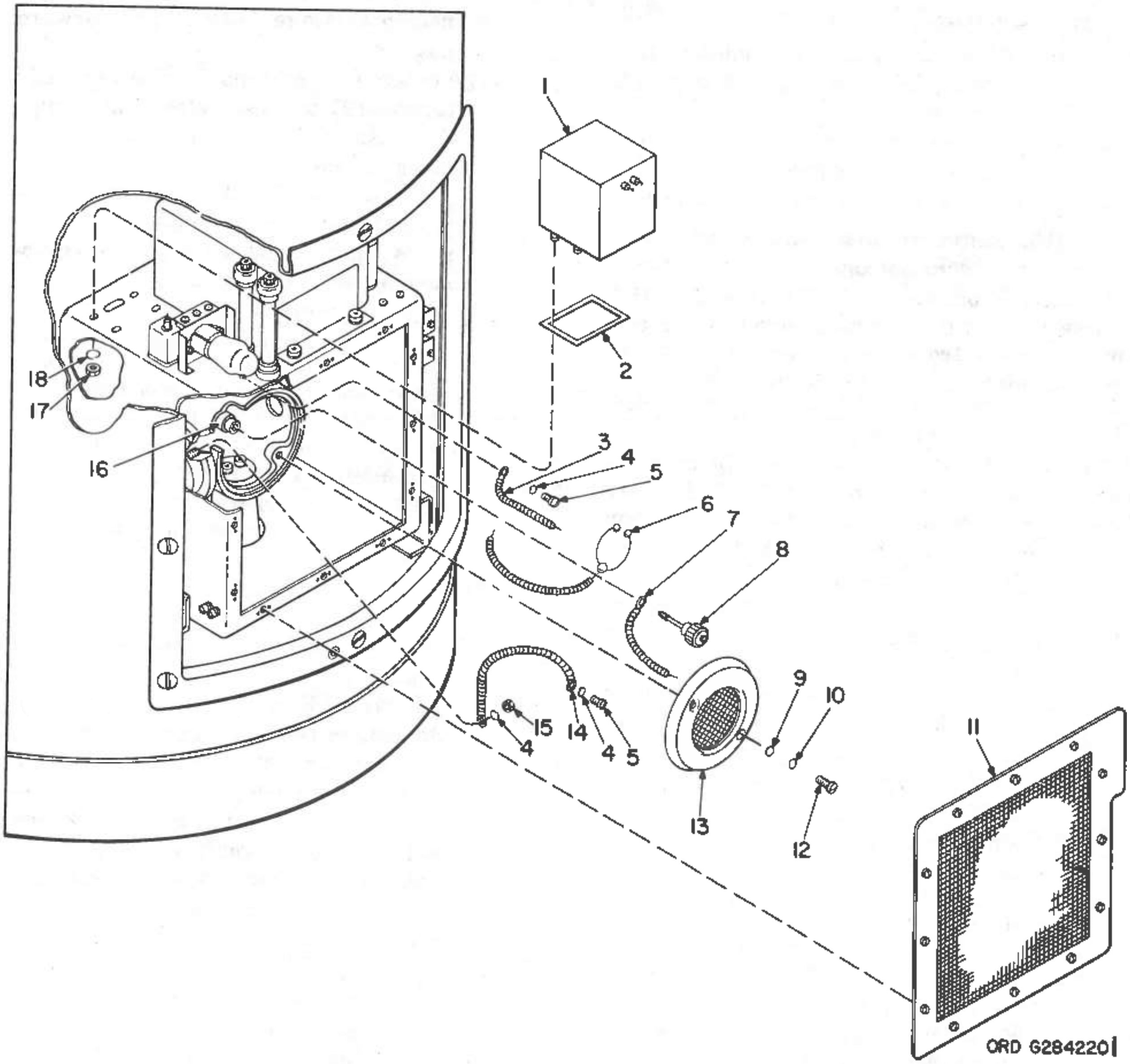
(5) Secure electrical clamps (7) and tighten four thumbscrews (1) and knurled adapter ring (3). Secure and tighten four fillister-head screws (2). The final position of the thumbscrews shall be as shown on figure 139.2.

(6) Reconnect hose coupling (6).

(7) Rotate flexible shaft (12) until magnetron dial (15) has the same reading as magnetron dial control (11). Connect and engage flexible shaft and tighten two setscrews (14).

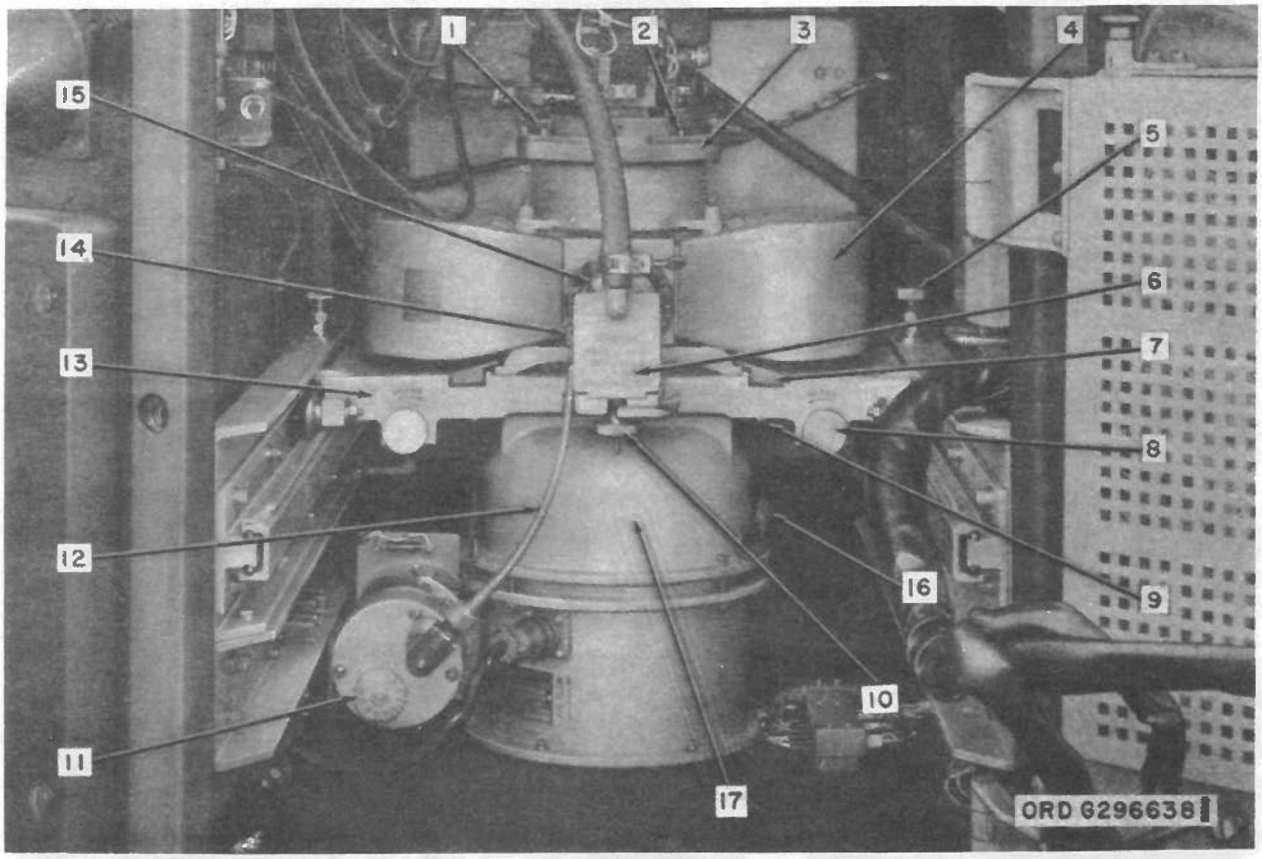
(8) Reconnect electrical lead with clip (6, fig. 139.1) to magnetron cathode.

(9) Replace and tighten externally relieved body screws (9) to magnetron.



1—Transformer (T2)—8016401
2—Gasket—7601014
3—Electrical lead—8173708
4—No. 8 lock washer—MS35338-23
5—No. 8-32 x 5/16 fil-hd screw—131958
6—Electrical lead—8173711—w/clip—8607289
7—Electrical lead—8173710
8—No. 10-24 x 2⅞ in. ext-rel body screw—8512799
9—No. 10 flat washer—446161
10—No. 10 lock washer—MS35338-24 (2)
11—Cover—8513926
12—No. 10-24 x ⅞ fil-hd screw—132056
13—Corona shield 8512803
14—Electrical lead—8173709
15—No. 8-32 hex nut—120622
16—Magnetron cathode
17—No. 10-24 cap nut—8516250 (4)
18—No. 10 lock washer—MS35338-24 (4)

Figure 139.1 (U). Acquisition receiver-transmitter corona shield compartment interior details (U).



1—Thumb screw (4)
2—Fil-hd screw (4)
3—Knurled adapter ring
4—(Magnetron) Electron tube V1, type 5795—7599353
5—Knurled locking screw (2)
6—Hose coupling
7—Electrical clamp
8—Release knob (2)
9—Ext-rel body screw
10—Knurled knob
11—Magnetron dial control
12—Flexible shaft—8517508
13—Magnetron carriage
14—Setscrew (2)
15—Magnetron dial
16—Latch (2)
17—Blower housing

Figure 139.2 (U). Acquisition receiver-transmitter removal of magnetron electron tube V1, type 5795 (U).

(10) Install and secure all covers.

c. Removal of Target or Missile Track Magnetron.

(1) Gain access to the track receiver-transmitter and track RF control-power supply group.

Note. The key numbers shown in parentheses in (2) through (6) below refer to figure 139.3.

(2) Record the dial readings on dial indicator of magnetron (14).

(3) Loosen setscrew (18) on adapter (19) and remove adapter from the magnetron.

(4) Disconnect arc suppressor lead (11) from the magnetron.

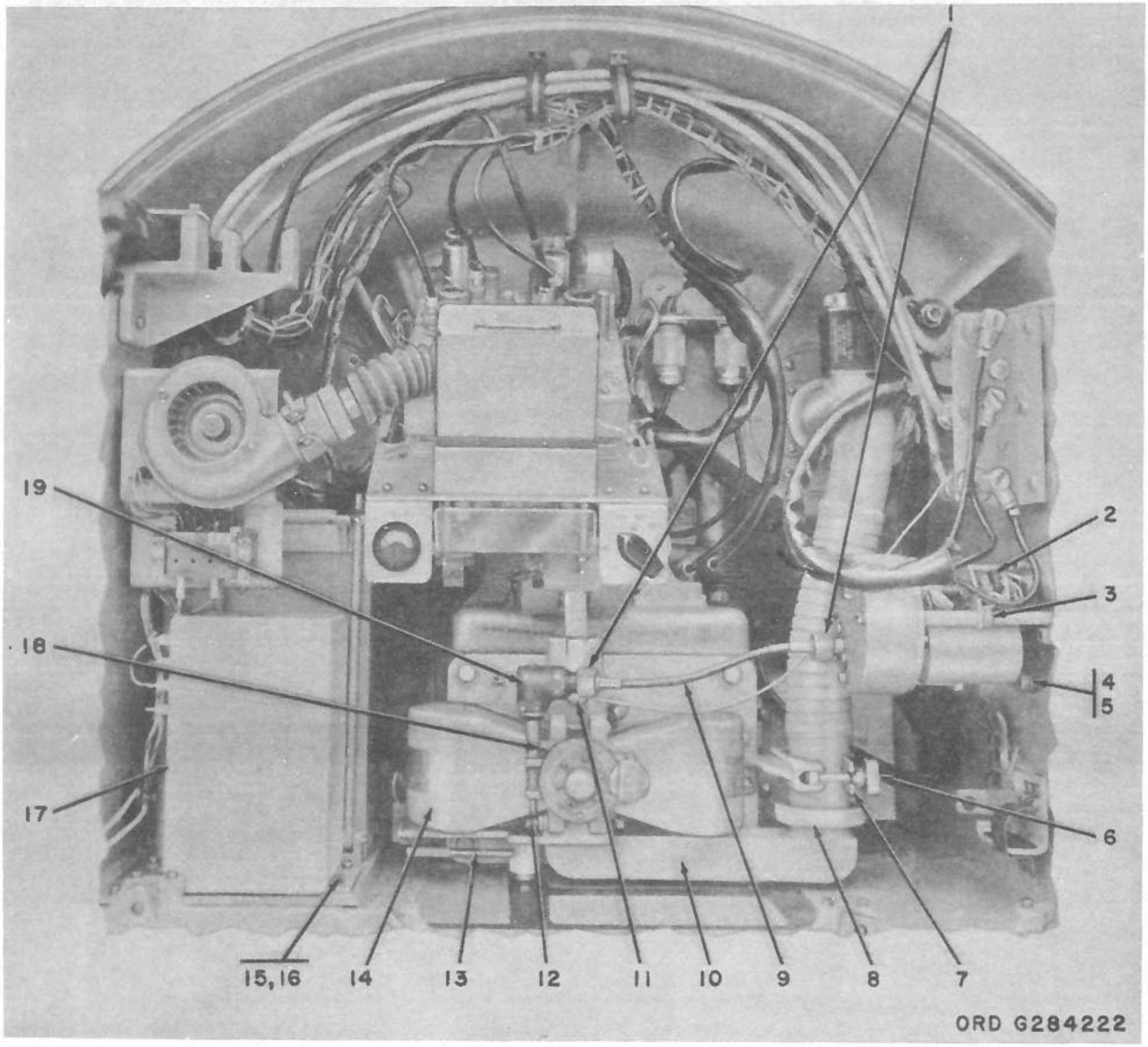
(5) Loosen air-conditioning pipe coupling (8), release threaded stud (13), and disengage air-conditioning pipe assembly (10) from the magnetron.

(6) Remove the four self-locking nuts (12) and remove the magnetron.

d. Installation of Target or Missile Track Magnetron.

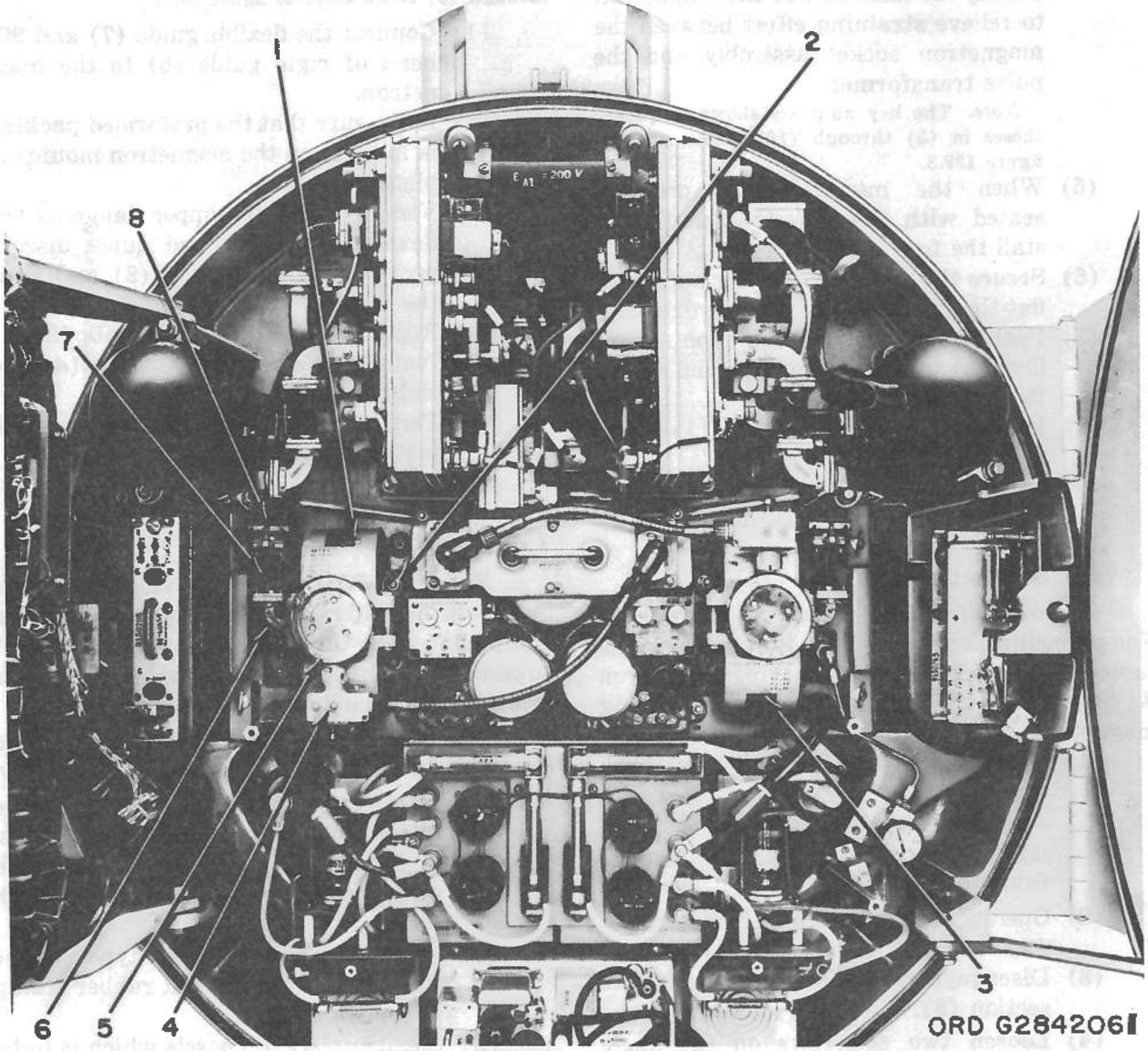
(1) Gain access to modulator compartment.

(2) Connect one clip of the shorting bar to the aluminum housing and the other clip of the shorting bar to the modulator grid electrical contact. The modulator grid is the smallest diam-



1—Knurled coupling (2)
2—Electrical receptacle connector (J4)
3—(Magnetron) tuning drive—7620907
4—¼-20 x ½ socket-hd cap screw—216278 (4)
5—¼ lock washer—7599448 (4)
6—Knob—8512532
7—Hose clamp—8511094
8—Air-conditioning pipe coupling
9—Flexible shaft—8517991
10—Air-conditioning pipe assy—8517979
11—Arc suppressor lead
12—¼-28 x ⅝ self-locking nut—8511163 (4)
13—Threaded stud
14—(Magnetron) electron tube (V4) type 5780—7599352
15—No. 10-24 x ½ fil-hd screw—120687 (4)
16—No. 10 lock washer—MS35338-24 (4)
17—-500V bias power supply (PS1)—8516178
18—Setscrew (2)
19—Adapter—8175129

Figure 139.3 (U). Target track receiver-transmitter—internal details (U).



1—Magnetron A
2—5/16-24 hex nut (4)
3—Magnetron B
4—Angle bracket assy
5—Magnetron A dial
6—90° bend of rigid guide
7—Flexible guide
8—Quick disconnect waveguide section

Figure 139.4 (U). Range receiver-transmitter—interior view (U).

eter ring clamp on the modulator tube.

Warning: **To protect personnel from possible burn injuries, place an asbestos shield or suitable protective material over modulator tube.**

(3) Insert the left hand through the modulator compartment into the magnetron hot box and connect the magnetron socket assembly to the magnetron.

Caution: **Exercise care when inserting the magnetron cathode into the magnetron socket assembly to maintain proper alinement and avoid unnecessary strain.**

(4) Support magnetron socket assembly during the insertion of the magnetron to relieve straining effect between the magnetron socket assembly and the pulse transformer.

Note. The key numbers shown in parentheses in (5) through (10) below refer to figure 139.3.

(5) When the magnetron is properly seated with the socket assembly, install the four self-locking nuts (12).

(6) Secure the four self-locking nuts with flat-tip (nonmagnetic) screwdriver.

(7) Position air-conditioning pipe assembly (10) to magnetron tube and secure threaded stud (13).

(8) Install arc suppressor lead (11) to the magnetron tube.

(9) Install adapter (19) and reset dial indication to that recorded in *b*(2) above.

(10) Secure two setscrews (18).

e. Removal of Target Ranging Magnetron. The procedure for removing magnetron A is the same as the procedure for removing magnetron B; therefore, only the procedure for removing magnetron A will be described.

(1) Gain access to the range receiver-transmitter.

Note. The key numbers shown in parentheses in (2) through (6) below refer to figure 139.4.

(2) Operate the magnetron to the extreme upper end of the frequency range.

(3) Disengage quick disconnect waveguide section (8).

(4) Loosen two setscrews on the angle bracket assembly (4) and slide the angle bracket assembly down until the tuning drive is disengaged.

(5) Remove the four hexagon nuts (2) and remove the magnetron.

(6) Move the magnetron to a suitable working area and remove the flexible guide (7) and short 90° bend of rigid guide (6) as one piece.

f. Installation of Target Ranging Magnetron. The procedure for installing magnetron A is the same as the procedure for installing magnetron B; therefore, only the procedure for installing magnetron A will be described.

Note. The key numbers shown in parentheses in (1) through (6) below refer to figure 139.4.

(1) Connect the flexible guide (7) and 90° bend of rigid guide (6) to the magnetron.

(2) Make sure that the preformed packing is in place on the magnetron mounting plate.

(3) Visually aline the upper flange of the flexible guide (7) and quick disconnect waveguide section (8) and slide the magnetron in place.

(4) Replace the four hexagon nuts (2).

(5) Install angle bracket assembly (4) and tighten the two setscrews.

(6) Perform magnetron tuning drive adjustment.

214 (U). Stamping Kit

a. Stamping kit 8150339 provides the items necessary to alter identification markings on equipment when these markings are changed or superseded. This kit also provides items for locating and securing change record plates.

b. Change the identifying number on a chassis as described in (1) through (7) below.

(1) Apply small amount of ink thinner to cotton cloth and rub off old markings. If old markings cannot be removed with thinner, obscure markings with stamp.

(2) If necessary, clean band type rubber stamp with thinner. Set rubber stamp to desired markings.

(3) Clean surface of chassis which is to be stamped.

(4) Ink rubber stamp and apply markings to chassis using a light, even pressure and a slight rocking motion to obtain full contact. Allow ink to dry for 1 minute.

(5) Use brush applicator to apply thin layer of coat cover over new markings. Brush very lightly or new markings will be obscured.

(6) Clean used portion of inking pad with thinner; check that caps on thinner, ink, and coat cover are tight. Replace all items in container.

(7) Return stamping kit to proper storage location.

c. Apply sealing cement to the threads of self-tapping screws used to secure change record plates to the record panels in the director station and tracking station trailers.

d. Use machinist steel rule to locate positions for DA MWO record plates on the equipment.

215 (U). Attaching RF Connectors to RF Cable

Refer to figure 140 for step-by-step procedure for attaching RF connectors to RF cable.

216 (U). Removal and Installation of Fuses

a. General. The fuses provided in the RCDC are mounted either in clips or fuseholders. Many fuseholders include an open-fuse indicator light which illuminates when the fuse is open. A visual inspection or a continuity check can also be performed to determine if a fuse is open. Always replace a fuse with one having the same, or lower, voltage and current rating. If the replacement fuse blows when installed, locate the malfunction and correct it before attempting further fuse replacement.

b. Fuses Mounted in Clips.

(1) Remove fuse.

(2) Check that contact surfaces of clips and of replacement fuse are clean.

(3) Check that clips have sufficient spring tension.

(4) Install fuse.

c. Fuses Mounted in Fuseholders.

(1) Remove fuseholder cap.

(2) Remove fuse from cap and install replacement fuse.

(3) Install cap.

d. Fuses in Multichannel Data Recorder.

(1) Remove fuseholder screw cap by turning clockwise with flat tip screwdriver.

(2) Remove fuse from cap and install replacement fuse.

(3) Install cap.

Section VI (U). CORRECTIVE MAINTENANCE OF TRAILER MOUNTED DIRECTOR STATION

217 (U). General

The replaceable chassis and components for the trailer mounted director station are listed in TM 9-1430-250-12P/9/2. Those that require detailed access, removal, and installation procedures are given in paragraphs 218 and 219. If additional illustrations are required to perform the procedures in this section, refer to TM 9-1430-250-12P/9/2.

218 (U). Removal and Installation of MTI Oscilloscope Cathode-Ray Tube

Warning: The MTI oscilloscope contains

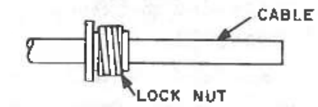
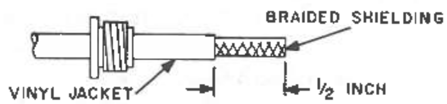
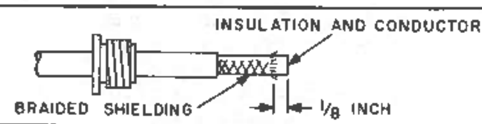
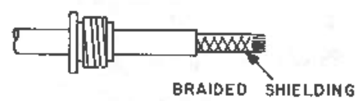
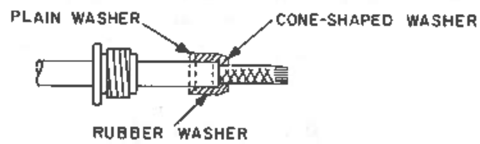
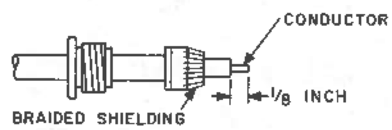
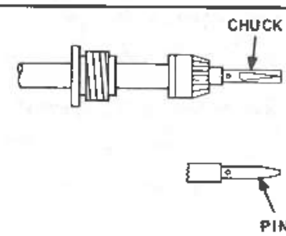
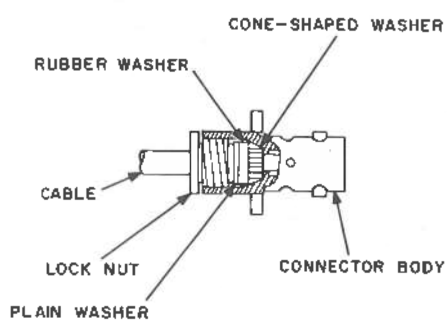
ILLUSTRATION	STEP	PROCEDURE
	1	CUT END OF CABLE EVEN AND SLIP LOCK NUT OVER CABLE
	2	REMOVE 1/2 INCH OF VINYL JACKET, BEING CAREFUL NOT TO NICK BRAIDED SHIELDING
	3	PUSH SHIELDING BACK AND REMOVE 1/8 INCH OF INSULATION AND CONDUCTOR
	4	TAPER SHIELDING
	5	SLIP PLAIN WASHER, RUBBER WASHER, AND CONE-SHAPED WASHER OVER CABLE. FIT INNER SHOULDER OF CONE-SHAPED WASHER AGAINST END OF JACKET
	6 7	COMB SHIELDING AND FOLD BACK OVER CONE-SHAPED WASHER. TRIM EVEN WITH OUTER EDGE OF CONE-SHAPED WASHER REMOVE 1/8 INCH OF INSULATION FROM CONDUCTOR AND TIN BARE CONDUCTOR THOROUGHLY
	8	SLIP PIN OR CHUCK IN PLACE AND SOLDER. REMOVE EXCESS SOLDER
	9	PUSH CABLE WITH ASSEMBLED PLAIN, RUBBER, AND CONE-SHAPED WASHERS AND ATTACHED PIN OR CHUCK INTO CONNECTOR BODY AS FAR AS IT WILL GO. SLIDE LOCK NUT FORWARD AND SCREW INTO CONNECTOR BODY TIGHTEN BY HAND

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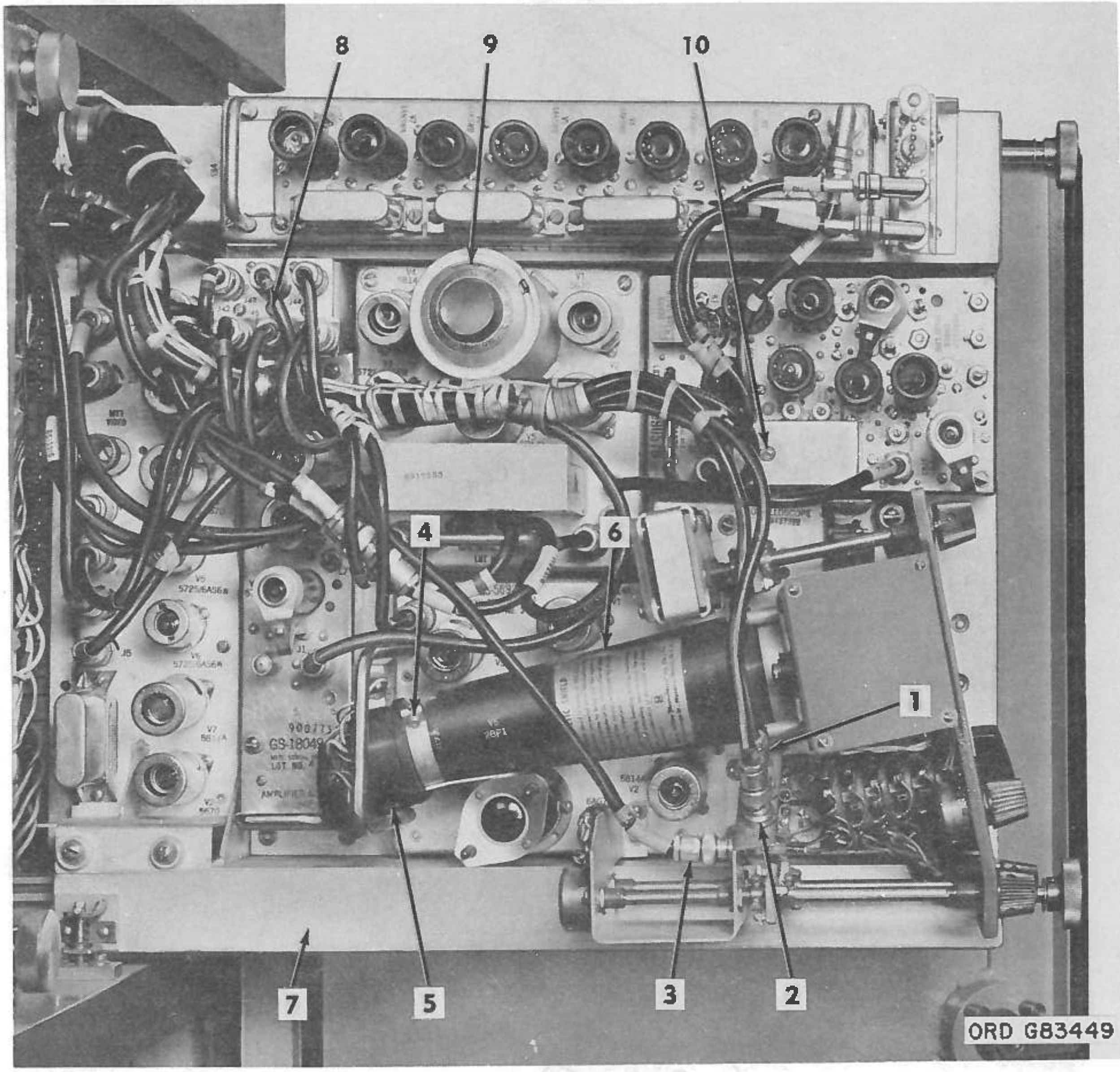
Figure 140 (U). Attachment of RF connector to RF cable (U).



1—Connectors P45 and J2
2—Connectors P65 and J3
3—Connectors P106 and J4
4—Clamp
5—Tube socket
6—Cathode-ray tube
7—Sliding assembly frame
8—Test pulse variable resistor
9—MTI delay network
10—Variable capacitor

Figure 141 (U). Director station group—view showing MTI oscilloscope (U).

voltages DANGEROUS TO LIFE. Be sure that PRESENTATION POWER switch is set to off (down) position before performing corrective maintenance.

Warning: **Be extremely careful when handling cathode-ray tube. Improper handling may cause tube envelope to break and implode, causing serious injury to personnel. Wear face mask and gloves when handling cathode-ray tube. After removal, insert cathode-ray tube in a container suitable for protecting personnel against injury from possible tube breakage.**

a. Gain access to MTI oscilloscope.

b. Disconnect connector P45 from connector

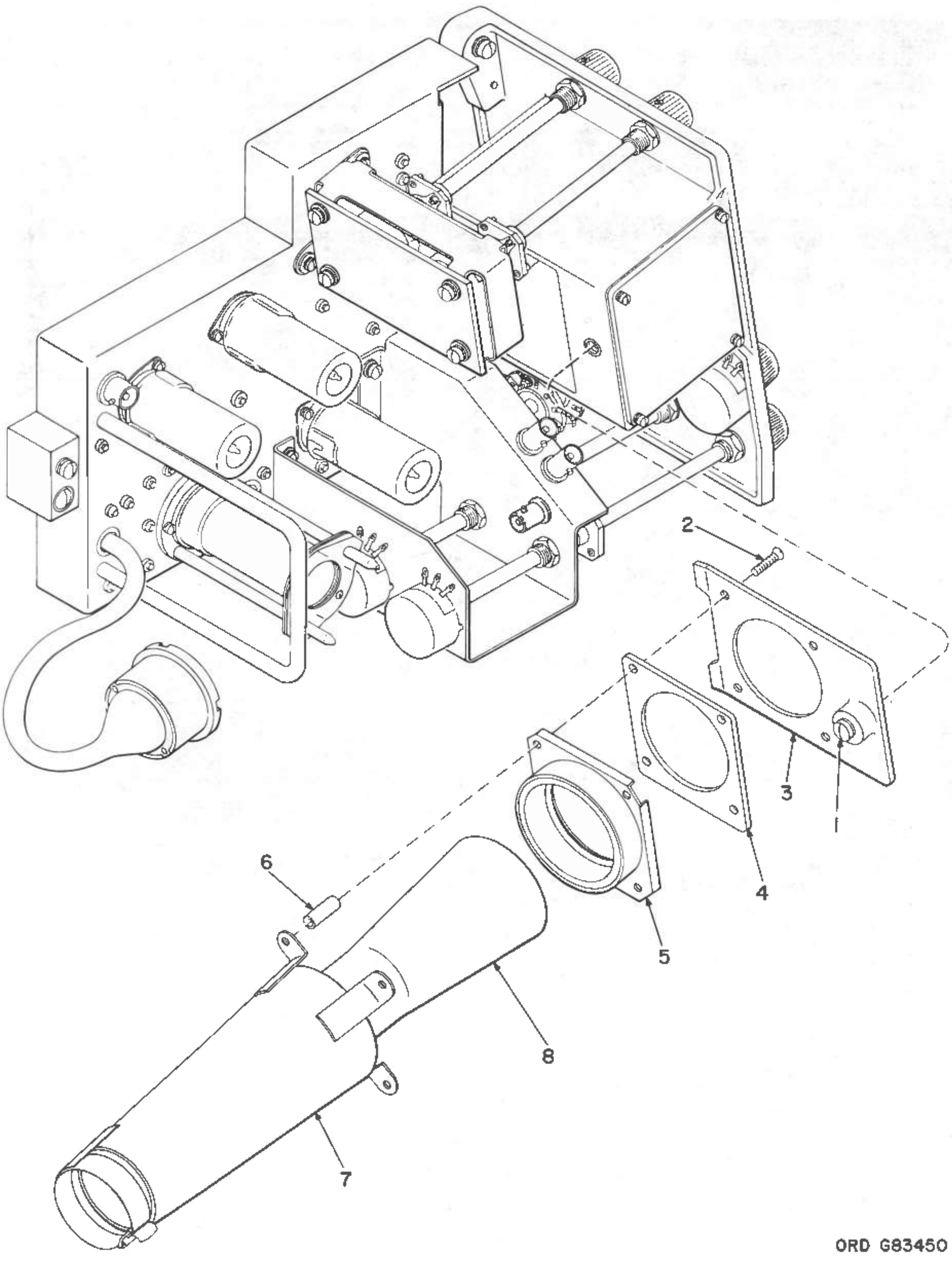


Figure 142 (U). MTI oscilloscope—partial exploded view (U).

1—Captive screw
2—No. 6-32 x 1⅛ fl-hd screw 5305-022-6795 (4)
3—Mounting plate 8513756
4—Plate 8513659
5—Electron tube retainer 5960-569-5839
6—Spacer 1430-564-9909 (4)
7—Tube shield 5960-569-5837
8—Cathode-ray tube 5960-170-4573

Figure 142 (U). MTI oscilloscope—partially exploded view—legend (U).

J2 (1, fig. 141), connector P65 from connector J3 (2, fig. 141), and connector P106 from connector J4 (3, fig. 141).

Note. The key numbers shown in parentheses in *c* and *d* below refer to figure 142.

c. Loosen captive screw (1).

d. Remove flat-head screws (2) that secure mounting plate (3); remove plate (4), electron tube retainer (5), and spacers (6).

e. Loosen clamp (4, fig. 141).

f. Disconnect tube socket (5, fig. 141) from cathode-ray tube (6, fig. 141).

g. Remove tube shield (7, fig. 142) and cathode-ray tube (8, fig. 142).

h. Install cathode-ray tube in tube shield.

i. Connect tube socket to cathode-ray tube.

j. Secure spacers, electron tube retainer, plate, and mounting plate to tube shield.

k. Position cathode-ray tube with attached parts and secure with captive screw; secure clamp.

l. Connect connector P45 to connector J2, connector P65 to connector J3, and connector P106 to connector J4.

m. Secure sliding assembly frame (7, fig. 141) and close acquisition power control panel.

219 (U). Removal and Installation of PPI Cathode-Ray Tube

a. Remove PPI to a suitable work area.

Note. The key numbers shown in parentheses in *b* through *o* below refer to figure 143.

***Warning:* Be extremely careful when handling cathode-ray tube. Improper handling may cause tube envelope to break and implode, causing serious injury to personnel. Wear face mask and gloves when handling cathode-ray tube. After removal, insert cathode-ray tube in a container suitable for protecting personnel against injury from possible tube breakage.**

b. Remove top and side screens (2, 3, and 4).

c. Swing open PPI marker generator (5) and PPI video amplifier (6).

d. Remove modulation eliminator (7).

e. Loosen captive screws (8), and remove front panel assembly (9).

f. Loosen hexagon socket-head screw (10) on lock ring (11). Rotate lock ring clockwise to release cathode-ray tube (16).

g. Loosen thumbscrews (12) on electron tube shield (13).

h. Loosen wing nuts (14) on electron tube shield, and loosen hexagon socket-head screws (15) securing electron tube shield.

i. Pull electron tube shield forward, and remove cathode-ray tube as shown on figure 143.

j. Aline pin No. 1 (17) on cathode-ray tube with corresponding number in electron tube socket (18), and insert cathode-ray tube.

k. Position electron tube shield, and tighten hexagon socket-head screws (15).

l. Tighten wing nuts on electron tube shield.

m. Rotate lock ring counterclockwise to secure tube, and tighten hexagon socket-head screw (10).

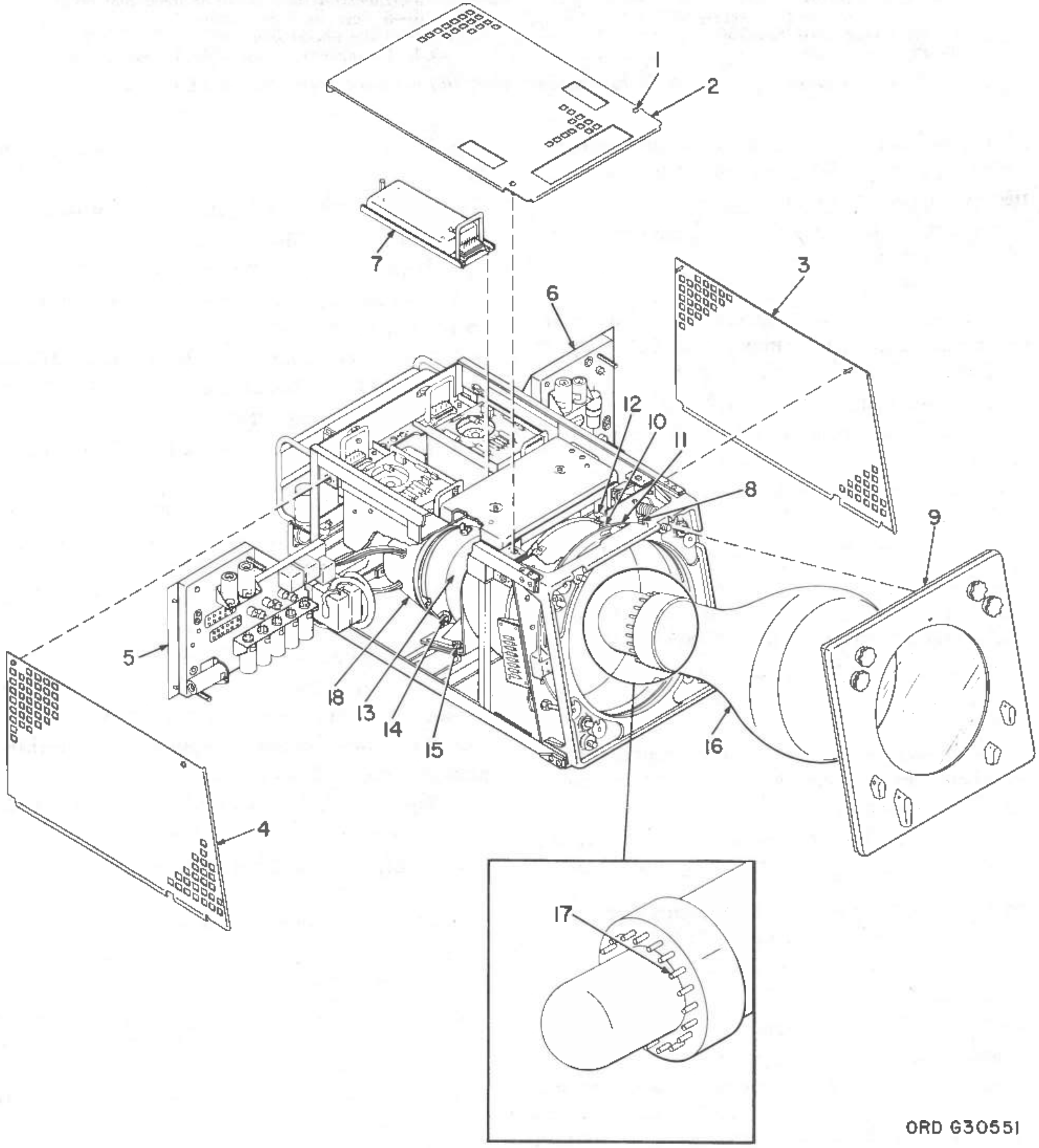
n. Finger tighten thumbscrews on electron tube shield until pressure is equalized and cathode-ray tube is firmly positioned.

Note. Be sure that knobs on front panel assembly are alined and engaged with hubs before tightening captive screws (8).

o. Install front panel assembly, and secure with captive screws.

p. Install modulation eliminator, and secure PPI marker generator and PPI video amplifier.

q. Install top and side screens; install and secure PPI.



1—Captive screw
2—Screen 8518931
3—Screen 9136155
4—Screen 9136154
5—PPI marker generator
6—PPI video amplifier
7—Modulation eliminator 9007951
8—Captive screw (4)
9—Front panel assembly 9143185
10—Hexagon socket-head screw
11—Lock ring
12—Thumbscrew (2)
13—Electron tube shield
14—Wing nut (3)
15—Hexagon socket-head screw (2)
16—Cathode-ray tube 5960-535-4550
17—Pin no. 1
18—Electron tube socket

Figure 143 (U). PPI—partially exploded view (U).

Section VII (U). CORRECTIVE MAINTENANCE OF TRAILER MOUNTED TRACKING STATION

220 (U). General

The replaceable chassis and components for the trailer mounted tracking station are listed in TM 9–1430–250–12P/7/2. Those that require detailed access, removal, and installation procedures are given in paragraphs 221 through 223. If additional illustrations are required to perform the procedures in this section, refer to TM 9–1430–250–12P/10/2.

221 (U). Removal and Installation of the Elevation, Azimuth, Range, and Target Range Indicator Cathode-Ray Tube

***Warning:* The target radar control console contains voltages DANGEROUS TO LIFE. Be sure that TARGET POWER switch is set to off (down) position before performing corrective maintenance.**

***Warning:* Be extremely careful when handling cathode-ray tube. Improper handling may cause tube envelope to break and implode, causing serious injury to personnel. Wear face mask and gloves when handling cathode-ray tube. After removal, insert cathode-ray tube in a container suitable for protecting personnel against injury from possible tube breakage.**

a. Remove indicator to a suitable work area.

Note. The key numbers shown in parentheses in *b* through *f* below refer to figure 144.

b. Release fastener catches (1), and remove cylinder shield (2) with bezel (3) attached.

c. Support front of cathode-ray tube (4) with one hand to prevent damage to tube.

***Warning:* Avoid contact with noninsulated portion of electrical contact clip. Voltages that may cause DEATH ON CONTACT are present.**

d. Disconnect and discharge electrical contact clip (7) from cathode-ray tube.

e. Remove cathode-ray tube.

f. Insert replacement cathode-ray tube through panel assembly (5) and into tube shield (6). Position cathode-ray tube so that electrical contact is adjacent to hole in tube shield.

g. Connect electrical contact clip to cathode-ray tube.

h. Aline cathode-ray tube pins with holes in tube socket.

i. Gently push against face of cathode-ray tube until it is properly seated.

j. Install cylinder shield with bezel attached.

***Caution:* Be sure that fastener catches do not come in contact with high voltage.**

k. Engage fastener catches to secure cylinder shield to tube shield.

l. Replace the indicator.

222 (U). Removal and Installation of B Scope Cathode-Ray Tube

***Warning:* The B scope indicator contains voltages DANGEROUS TO LIFE. Be sure that MAIN POWER switch is set to off (down) position before performing corrective maintenance.**

***Warning:* Be extremely careful when handling cathode-ray tube. Improper handling may cause tube envelope to break and implode, causing serious injury to personnel. Wear face mask and gloves when handling cathode-ray tube. After removal, insert cathode-ray tube in container suitable for protecting personnel against injury from possible tube breakage.**

a. Gain access to B scope indicator and place in service position.

Note. The key numbers shown in parentheses in *b* through *n* below refer to figure 145.

b. Remove top and side screens (2, 3, and 4).

c. Swing open B scope marker generator (5) and B scope video amplifier (6).

d. Remove dust and moisture seal boot (7).

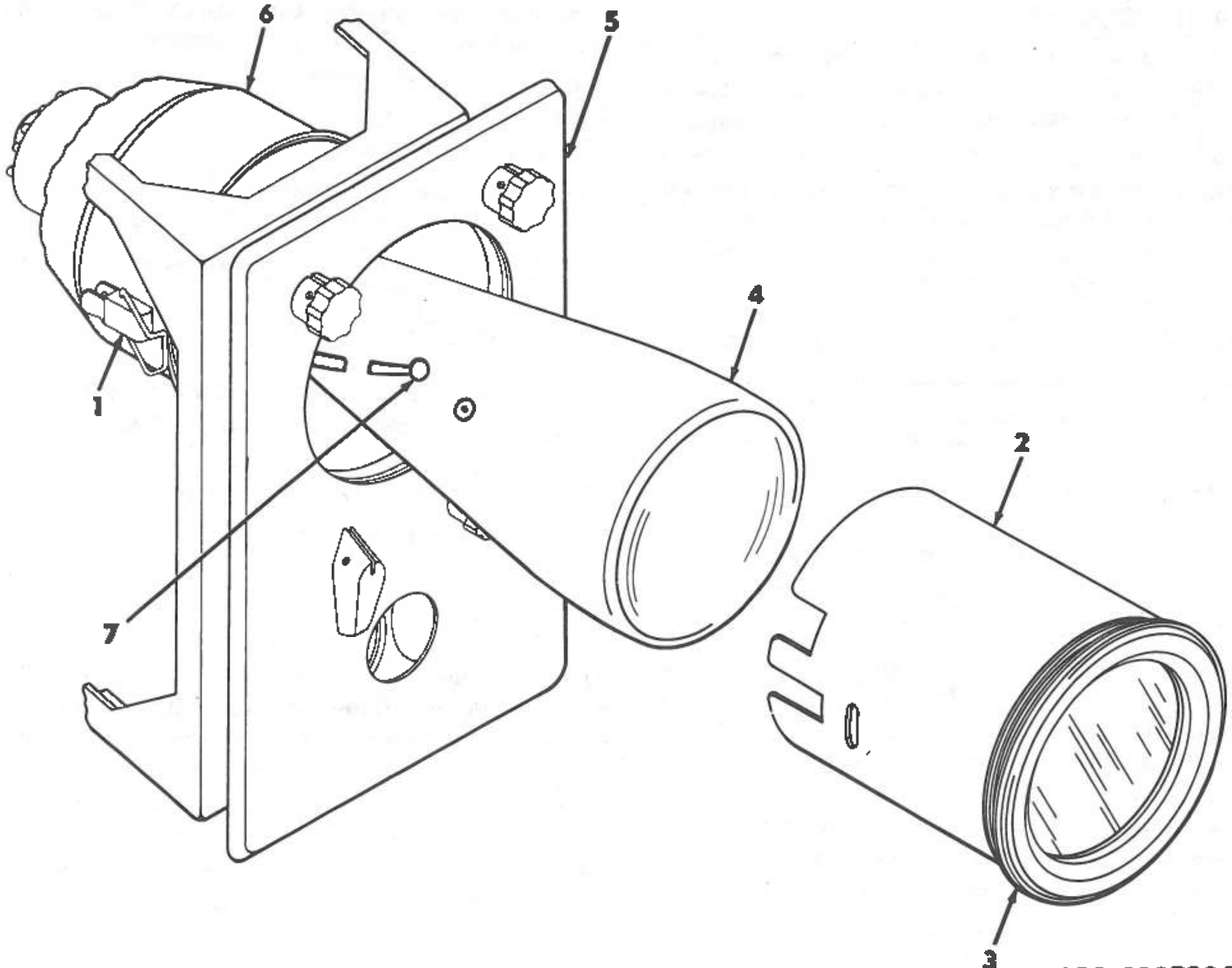
e. Remove B scope modulation eliminator (8).

f. Loosen captive screws (9), and remove panel assembly (10).

g. Loosen hexagon socket-head screw (11) on lock ring (12). Rotate lock ring clockwise to release cathode-ray tube (17).

h. Loosen thumbscrews (13) on electron tube shield (14).

i. Loosen wing nuts (15) on electron tube shield, and loosen hexagon socket-head screws (16) securing electron tube shield.



1—Fastener catch (2)
2—Cylinder shield 1230-761-4360
3—Bezel 7604438
4—Cathode-ray tube 5960-300-1135
5—Panel assembly
6—Tube shield
7—Electrical contact clip

Figure 144 (U). Elevation, azimuth, range or target range indicator—front view—partially exploded view (U).

j. Pull electron tube shield forward and remove cathode-ray tube.

k. Aline pin No. 1 (18) on replacement cathode-ray tube with corresponding number in electron tube socket (19) and insert cathode-ray tube.

l. Position electron tube shield and tighten hexagon socket-head screws (16).

m. Tighten wing nuts on electron tube shield.

n. Rotate lock ring counterclockwise to secure tube and tighten hexagon socket-head screw (11).

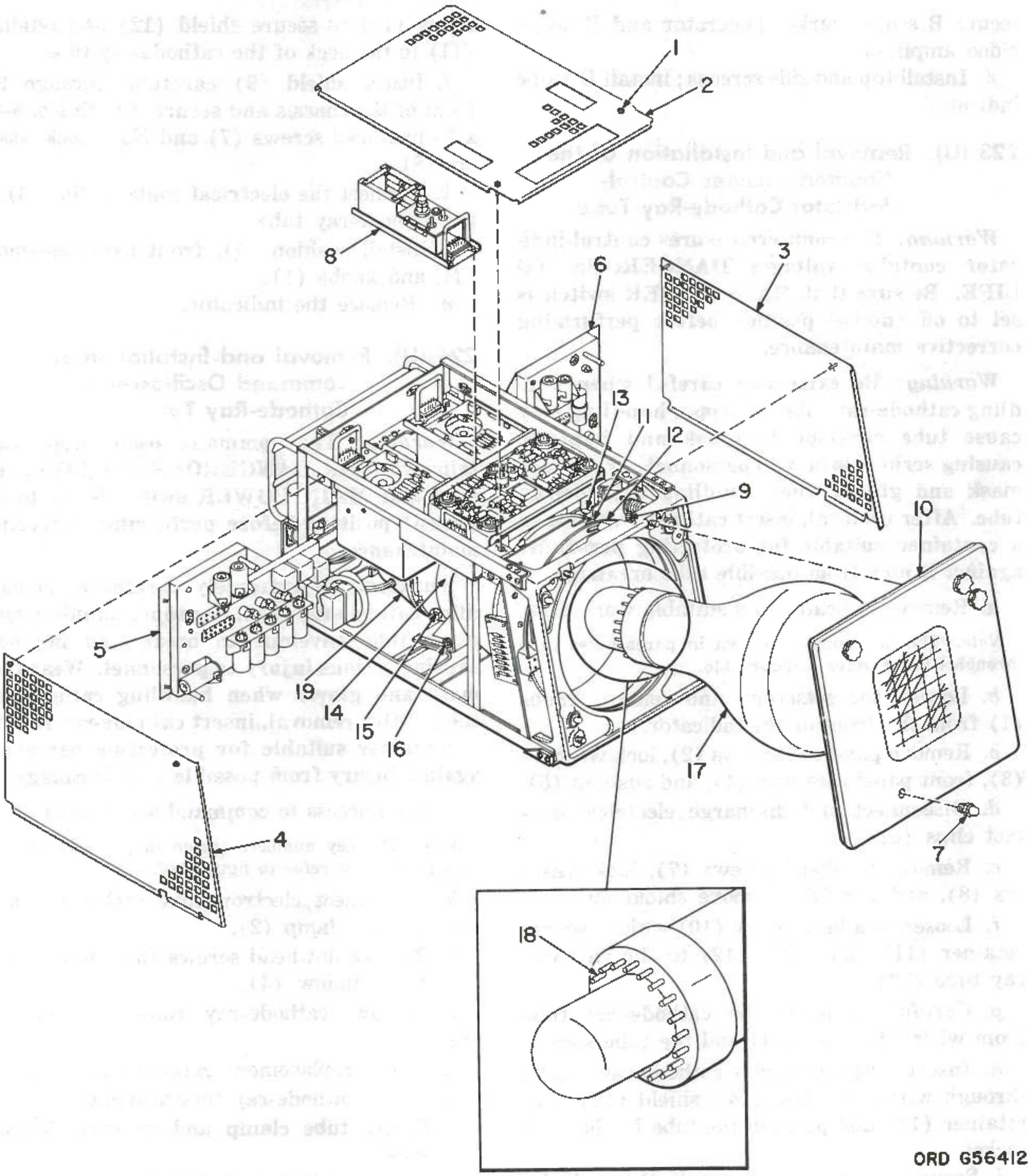
o. Finger tighten thumbscrews on electron tube shield until pressure is equalized and cathode-ray tube is firmly positioned.

Note. Be sure that knobs on panel assembly are alined and engaged before tightening captive screws.

p. Install and secure panel assembly.

q. Install dust and moisture seal boot.

r. Install B scope modulation eliminator and



1—Captive screw
2—Screen 8518931
3—Screen 9144897
4—Screen 9144896
5—B scope marker generator
6—B scope video amplifier
7—Dust and moisture seal boot 5975-621-9852
8—B scope modulation eliminator 9160636
9—Captive screw (4)
10—Panel assembly 9144879
11—Hex socket-hd screw
12—Lock ring
13—Thumbscrew (2)
14—Electron tube shield
15—Wing nut (3)
16—Hex socket-hd screw (2)
17—Cathode-ray tube 5960-535-4550
18—Pin no. 1
19—Electron tube socket

Figure 145 (U). B scope indicator—partially exploded view (U).

secure B scope marker generator and B scope video amplifier.

s. Install top and side screens; install B scope indicator.

223 (U). Removal and Installation of the Countermeasures Control-Indicator Cathode-Ray Tube

Warning: **The countermeasures control-indicator contains voltages DANGEROUS TO LIFE. Be sure that MAIN POWER switch is set to off (down) position before performing corrective maintenance.**

Warning: **Be extremely careful when handling cathode-ray tube. Improper handling may cause tube envelope to break and implode, causing serious injury to personnel. Wear face mask and gloves when handling cathode-ray tube. After removal, insert cathode-ray tube in a container suitable for protecting personnel against injury from possible tube breakage.**

a. Remove indicator to a suitable work area.

Note. The key numbers shown in parentheses in *b* through *l* below refer to figure 146.

b. Loosen the setscrews and remove knobs (1) from the front of the indicator.

c. Remove pan-head screws (2), lock washers (3), front panel assembly (4), and cushion (5).

d. Disconnect and discharge electrical contact clips (6).

e. Remove pan-head screws (7), lock washers (8), and carefully remove shield (9).

f. Loosen pan-head screw (10) which secures retainer (11) and shield (12) to the cathode-ray tube (13).

g. Carefully remove the cathode-ray tube from wiring harness (14) and the tube socket.

h. Insert replacement cathode-ray tube through wiring harness (14), shield (12), and retainer (11) and position the tube in the tube socket.

i. Secure the wiring harness to the cathode-ray tube and tighten No. 6–32 x 5/8 pan-head screw (10) to secure shield (12) and retainer (11) to the neck of the cathode-ray tube.

j. Insert shield (9) carefully through the front of the chassis and secure it with No. 6–32 x 3/8 pan-head screws (7) and No. 6 lock washers (8).

k. Connect the electrical contact clips (6) to the cathode-ray tube.

l. Install cushion (5), front panel assembly (4), and knobs (1).

m. Replace the indicator.

224 (U). Removal and Installation of Command Oscilloscope Cathode-Ray Tube

Warning: **The command oscilloscope contains voltages DANGEROUS TO LIFE. Be sure that MAIN POWER switch is set to off (down) position before performing corrective maintenance.**

Warning: **Be extremely careful when handling cathode-ray tube. Improper handling may cause tube envelope to break and implode, causing serious injury to personnel. Wear face mask and gloves when handling cathode-ray tube. After removal, insert cathode-ray tube in a container suitable for protecting personnel against injury from possible tube breakage.**

a. Gain access to command oscilloscope.

Note. The key numbers shown in parentheses in *b* through *d* below refer to figure 147.

b. Disconnect electron tube socket (1) and release tube clamp (2).

c. Remove flat-head screws (3) and cathode-ray tube window (4).

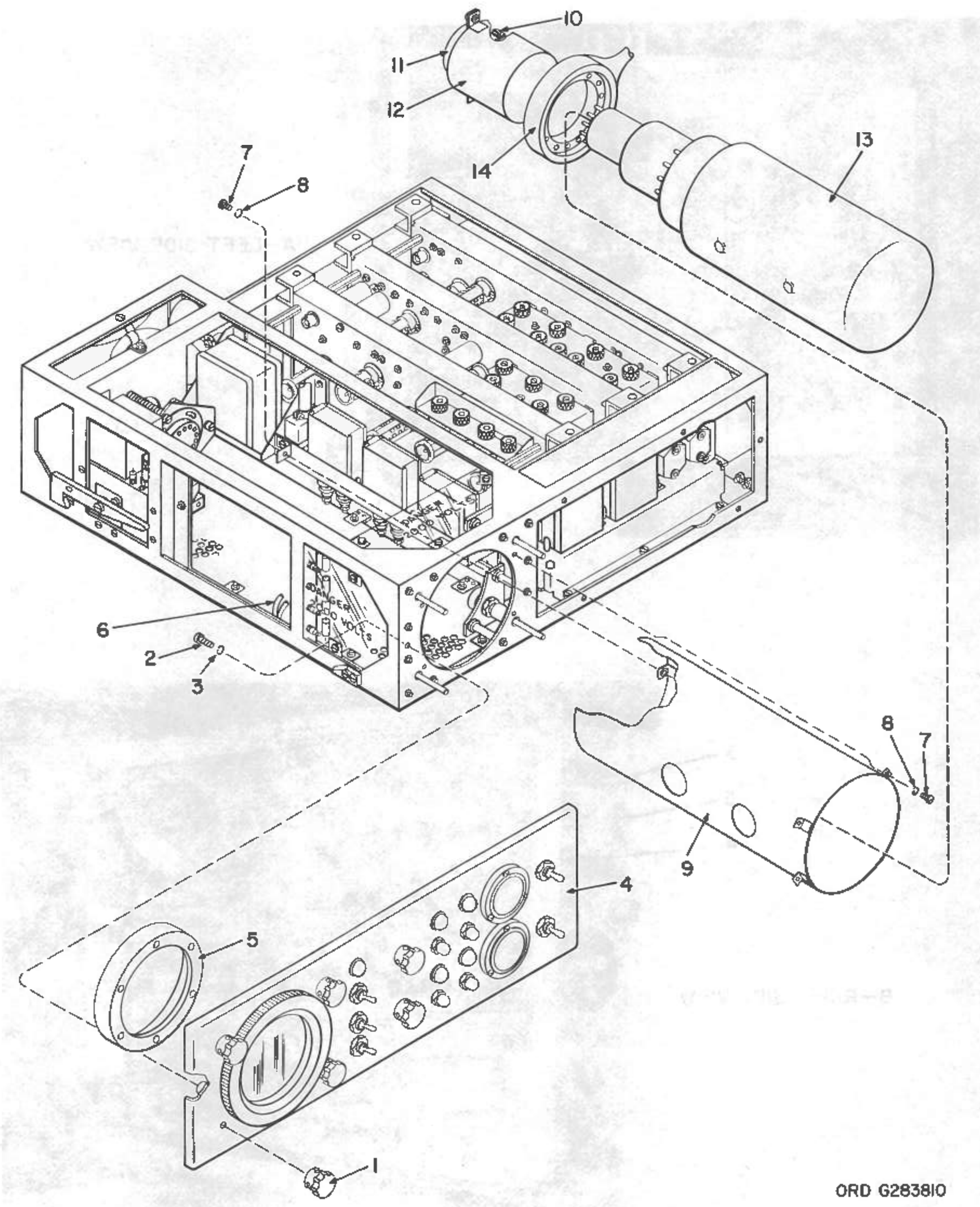
d. Remove cathode-ray tube (5) through aperture.

e. Install replacement cathode-ray tube.

f. Install cathode-ray tube window.

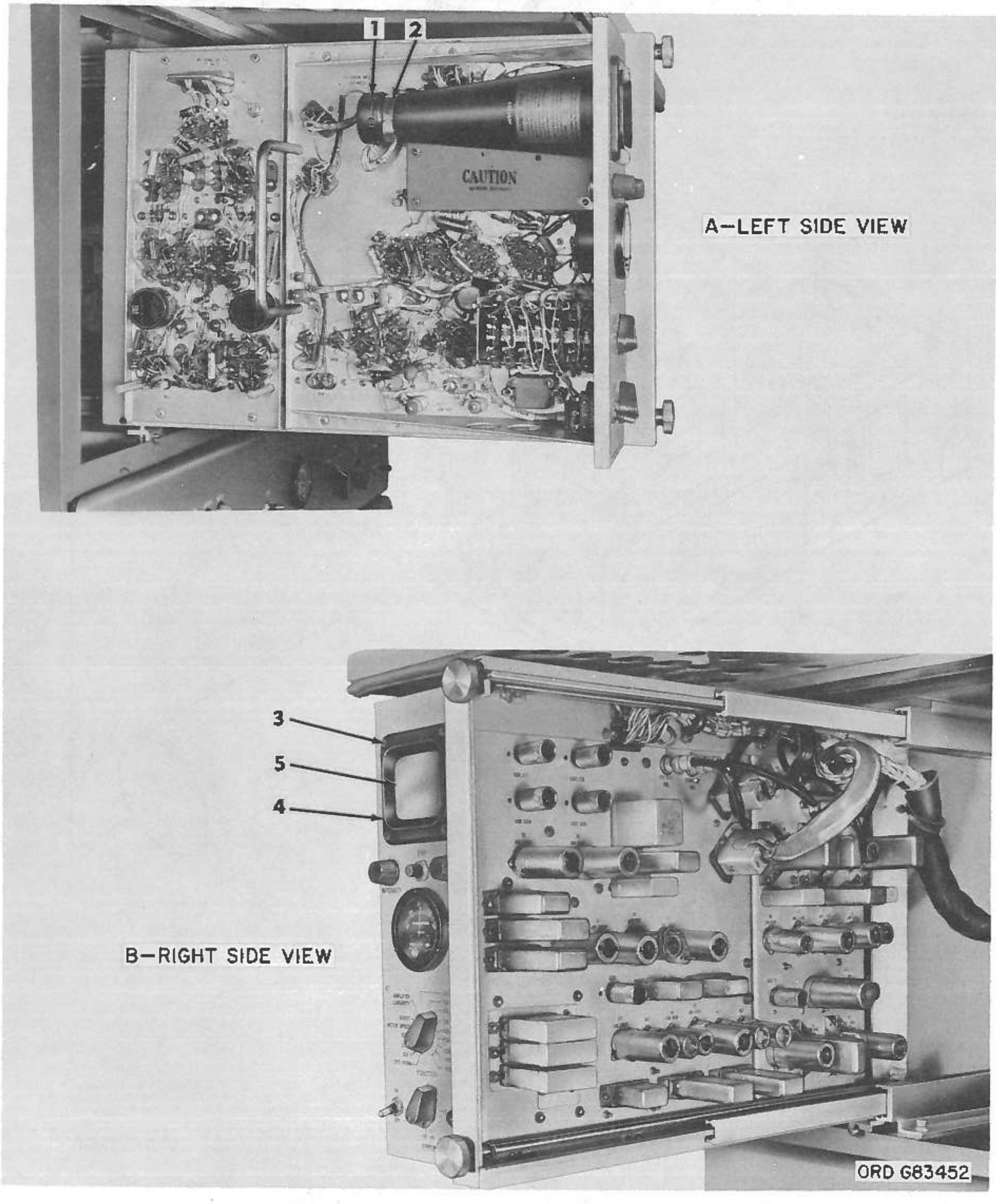
g. Secure tube clamp and connect electron tube socket.

h. Secure sliding assembly frame and close door assembly.



1—Knob 7599369 (4)
2—No. 10-24 x ¾ pan-hd screw MS35225-65 (6)
3—No. 10 lock washer MS35338-24 (6)
4—Front panel assembly
5—Cushion 8517228
6—Electrical contact clips
7—No. 6-32 x ⅜ pan-hd screw MS35225-28 (6)
8—No. 6 lock washer MS35338-22 (6)
9—Shield 9139496
10—No. 6-32 x ⅝ pan-hd screw MS35225-31
11—Retainer 9139498
12—Shield 9139497
13—Cathode-ray tube 9024866
14—Wiring harness 9141279

Figure 146 (U). Countermeasures control-indicator—partially exploded view (U).



1—Electron tube socket
2—Tube clamp
3—No. 6-32 x ½ fl-hd screw 133432 (4)
4—Cathode-ray tube window 1430-565-0284
5—Cathode-ray tube 8158395

Figure 147 (U). Command oscilloscope—extended—left and right side views (U).

Section VIII. (C). CORRECTIVE MAINTENANCE OF TARGET RANGE ANTENNA-RECEIVER-TRANSMITTER GROUP

225 (U). General

The replaceable chassis and components for the target range antenna-receiver-transmitter group are listed in TM 9-1430-250-12P/8/2. Those that require detailed access, removal, and installation procedures are given in paragraph 97.2.

226 (U). Repairs to Target Range Antenna-Receiver Transmitter

Warning: **Before working on the target range antenna support group of a tower-mounted target range antenna-receiver-transmitter group, install guard rails on antenna support base platforms to prevent personnel from accidentally falling from platforms.**

Warning: **The target range antenna-receiver-transmitter contains voltages DANGEROUS TO LIFE. Be sure TRR POWER switch S2 and the MAIN POWER switch in the tracking station group are set to off (down) before performing corrective maintenance. Be sure that BLOWER switch S7 is set to OFF and ANTENNA DISABLE switch S1 is set to disable (up).**

Note. After any repairs to the target range antenna-receiver-transmitter, refer to TM 9-1430-256-12/1 for necessary checks and adjustments.

Note. The key numbers shown in parentheses in *a* through *c* below refer to figure 148.

a. Removal and Installation of RF Oscillator Mounted on Right-Hand Side of Range Receiver-Transmitter.

(1) Gain access to the range receiver-transmitter.

(2) Disconnect electrical cable connector (1) from RF oscillator (4).

(3) Release clamp (2) to disconnect waveguide (7).

Note. Cover the waveguide openings to prevent entrance of foreign matter.

(4) Remove leveling screws (3) and carefully remove RF oscillator (4).

(5) Remove hexagon socket-head screws (5), lock washers (6), and remove waveguide (7) from RF oscillator.

(6) Remove self-locking pan-head screws (8) and three mounting blocks (9 and 10).

(7) Secure the three mounting blocks on the RF oscillator with six self-locking pan-head screws (8).

(8) Secure waveguide to RF oscillator with four 6-32 x 3/8 hexagon socket-head screws (5) and No. 6 lock washers (6).

(9) Carefully position the RF oscillator and secure it with three leveling screws (3). Adjust the leveling screws for exact alinement at the waveguide connection and secure with clamps (2).

(10) Connect electrical cable connector (1).

(11) Close and secure range RF control-power supply group.

(12) Close and secure cover assembly.

b. Removal and Installation of RF Oscillator Mounted on Left-Hand Side of Range Receiver-Transmitter.

(1) Gain access to range receiver-transmitter.

(2) Disconnect electrical cable connector (11) from RF oscillator (4).

(3) Release clamp (2) to disconnect waveguide (15).

Note. Cover the waveguide openings to prevent the entrance of foreign matter.

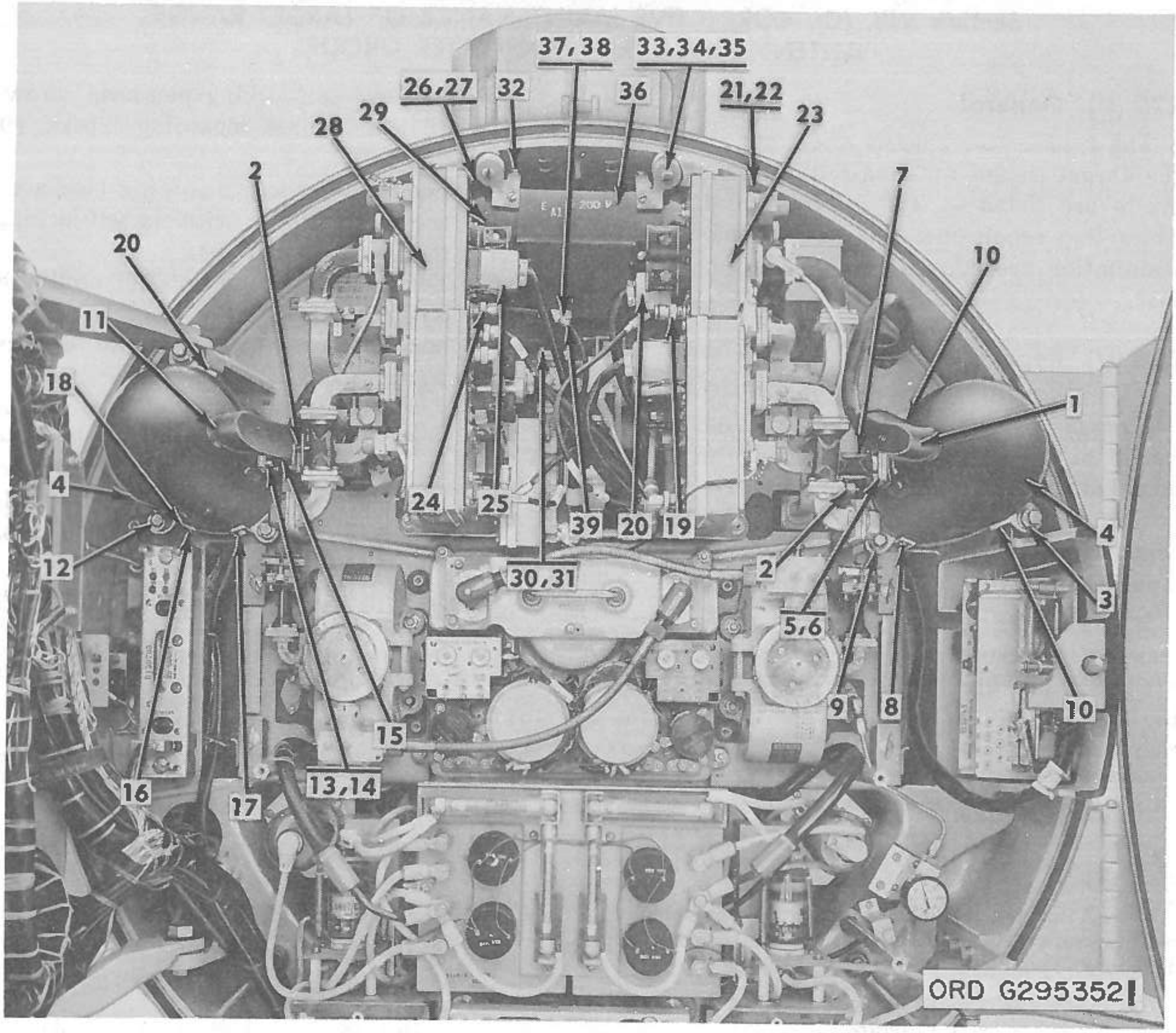
(4) Remove three leveling screws (12) and carefully remove RF oscillator (4).

(5) Remove hexagon socket-head screws (13), lock washers (14), and remove waveguide (15) from RF oscillator.

(6) Remove self-locking pan-head screws (16) and three mounting blocks (17 and 18).

(7) Install three mounting blocks (17 and 18) on the RF oscillator and secure them with six self-locking, pan-head screws (16).

(8) Secure waveguide to RF oscillator with four 6-32 x 3/8 hexagon socket-



1—Electrical cable connector
2—Clamp
3—Leveling screw 9012401 (3)
4—RF oscillator 9986180 (2)
5—No. 6-32 x 3/8 hexagon socket-head screw MS35457-7 (4)
6—No. 6 lock washer 5310-045-0591 (4)
7—Waveguide 9150822
8—Pan-head screw 9976283-1 (6)
9—Mounting block 9143646
10—Mounting block 9012432 (2)
11—Electrical cable connector
12—Leveling screw 9012401 (3)
13—No. 6-32 x 3/8 hexagon socket-head screw MS35457-7 (4)
14—No. 6 lock washer 5310-045-0591 (4)
15—Waveguide 9150822
16—Pan-head screw 9976283-1 (6)
17—Mounting block 9143647
18—Mounting block 9012432 (2)
19—Connectors P20 and J2
20—Connectors P21 and J1
21—No. 8-32 x 7/8 pan-head screw MS35233-48 (4)
22—No. 8 lock washer 5310-054-1830 (4)
23—Range IF pre amplifier 9009786
24—Connectors P12 and J2
25—Connectors P13 and J1
26—No. 8-32 x 7/8 pan-head screw MS35233-48 (4)
27—No. 8 lock washer 5310-054-1830 (4)
28—Range IF pre amplifier 9009786
29—Electrical cable connector
30—No. 6-32 x 3/8 hexagon socket-head screw MS35457-7 (4)
31—No. 6 lock washer 5310-045-0591 (4)
32—Pan-head screw 9976283-1 (6)
33—1/4-20 x 1-1/4 cap screw MS35457-38
34—1/4-inch lock washer MS35338-25
35—1/4-inch fl washer MS15795-210
36—RF oscillator 9986180
37—No. 6-32 x 3/8 hexagon socket-head screw MS35457-7 (4)
38—No. 6 lock washer 5310-045-0591 (4)
39—Waveguide 9012233

Figure 148 (C). Range receiver-transmitter—internal view (U).

head screws (13) and no. 6 lock washers (14).

(9) Carefully position the RF oscillator and secure it with three leveling screws (12); adjust the leveling screws for exact alinement at the waveguide connections and secure it with clamp (2).

(10) Connect electrical cable connector (11).

(11) Close and secure range RF control-power supply group.

(12) Close and secure cover assembly.

c. Removal and Installation of RF Oscillator Mounted in Top Center Range Receiver-Transmitter.

(1) Gain access to range receiver-transmitter.

(2) Disconnect connector P20 (19) from connector J2 and connector P21 (20) from connector J1.

(3) Remove pan-head screws (21) and lock washers (22); remove range IF pre amplifier (23).

(4) Disconnect connector P12 (24) from connector J2 and connector P13 (25) from connector J1.

(5) Remove pan-head screws (26) and lock washers (27); remove range IF pre amplifier (28).

(6) Disconnect electrical cable connector (29) from RF oscillator (36).

(7) Remove hexagon socket-head screws (30) and lock washers (31).

(8) Remove cap screws (33), lock washers (34) and flat washers (35) and remove the RF oscillator (36).

Note. Cover the waveguide openings to prevent the entrance of foreign matter.

(9) Mark the position of the screws on the mounting blocks and remove the pan-head screws (32) and the mounting blocks from the RF oscillator (36).

(10) Remove the hexagon socket-head screws (37), lock washers (38), and waveguide (39).

(11) Aline the slot in the waveguide (39) with the slot in the RF oscillator (36) and secure the waveguide to the RF oscillator with four No. 6-32 x 3/8 hexagon socket-head screws (37) and No. 6 lock washers (38).

(12) Install the mounting blocks on the RF oscillator (36) alining the screws at the marks made in step (9) above and secure them with six pan-head screws (32).

(13) Place the RF oscillator (36) in mounting position alining the waveguides and secure it with three 1/2-20 x 1-1/4 cap screws (33), 1/4-inch lock washers (34) and 1/4-inch flat washers (35).

(14) Secure the waveguide connection with four hexagon socket-head screws (37) and No. 6 lock washers (38).

(15) Connect the electrical cable connector (29) to the RF oscillator (36).

(16) Secure range IF preamplifier (28) with four No. 8-32 x 7/8 pan-head screws (26) and No. 8 lock washers (27).

(17) Connect connector P12 (24) to connector J2 and connector P13 (25) to connector J1.

(18) Secure range IF preamplifier (23) with four No. 8-32 x 7/8 pan-head screws (21) and No. 8 lock washers (22).

(19) Connect connector P20 (19) to connector J2 and connector P21 (20) to connector J1.

(20) Close and secure the range RF control-power supply group.

(21) Close and secure cover assembly.

Section IX (U). CORRECTIVE MAINTENANCE OF LOPAR ANTENNA-RECEIVER-TRANSMITTER GROUP

227 (U). General

Any damage to the cover assembly (radome) must be repaired immediately to prevent foreign matter from entering the honeycombed center lamination where it would affect the antenna radiation pattern. If the center lamination has been damaged, or if any damaged area is greater than 3 inches in diam-

eter, notify Ordnance maintenance personnel. All repair parts and materials required for repair of the LOPAR antenna-receiver-transmitter group are listed in TM 9-1430-250-12P/2/1. Instructions for a temporary and a permanent repair of the cover assembly are given in paragraph 228 *a* and *b*.

Note. After any repairs to acquisition antenna in which antenna and IFF equipment have been removed, refer to TM 9-1430-255-12/1 for necessary checks and adjustments.

Note. Protect the damaged area of the cover assembly during adverse weather conditions.

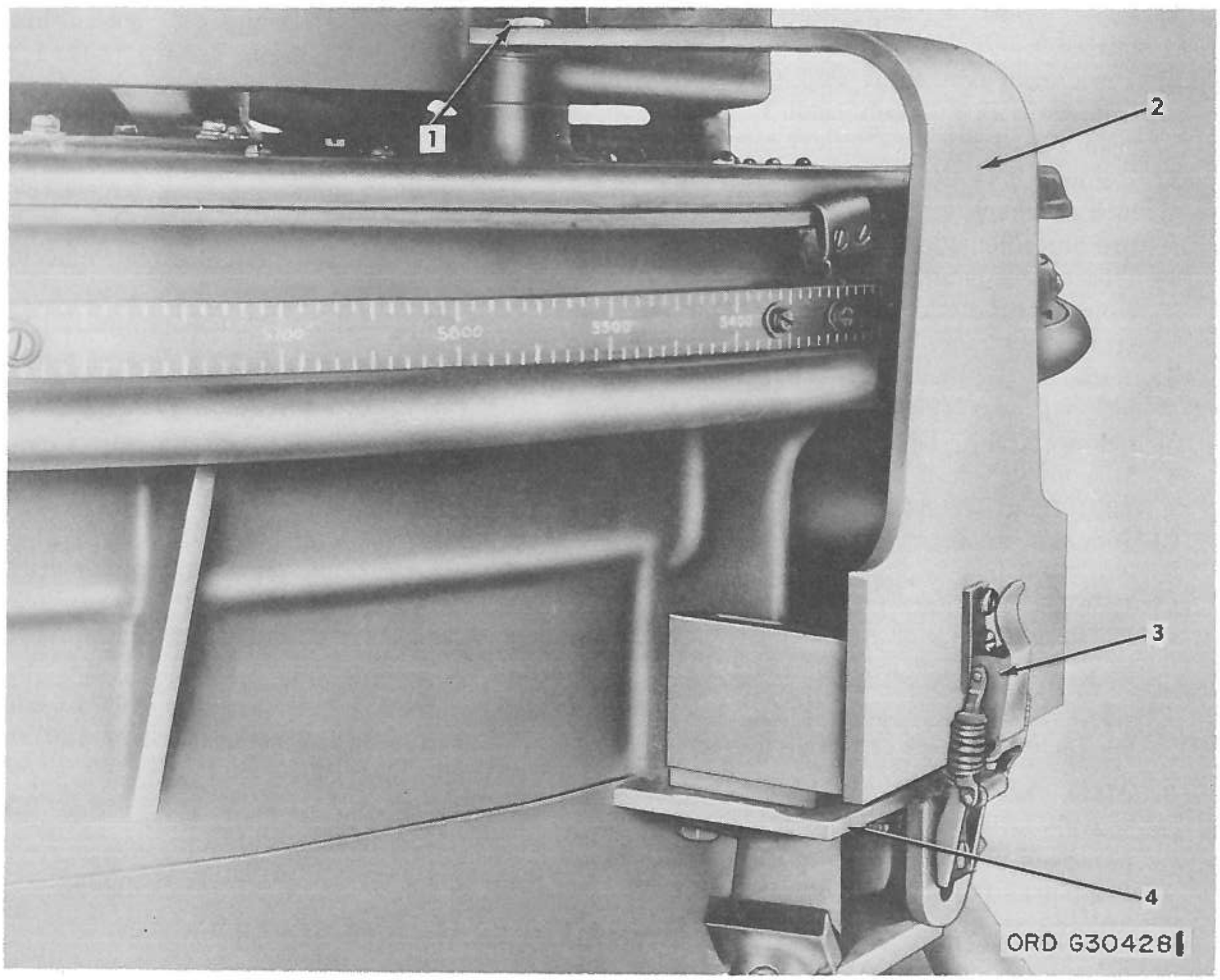
228 (U). Repairs to Cover Assembly (Radome)

a. Temporary Repair.

***Warning:* If the acquisition antenna is not removed, install anti-rotational lock (2, fig. 149) between hexagon-head cap screw (1, fig. 149) and pedestal support bracket (4, fig. 149), and secure with latch (3, fig. 149) to prevent possible injury to personnel.**

(1) If necessary for access, remove IFF equipment (if installed) and acquisition antenna as prescribed in TM 9-1430-251-10/1.

(2) Clean the damaged area with trichloroethane 6810-664-0387.



1—Hexagon-head cap screw
2—Anti-rotational lock 5340-331-2196
3—Latch
4—Pedestal support bracket

Figure 149 (U). LOPAR antenna-receiver-transmitter group—partial side view—anti-rotational lock installed (U).

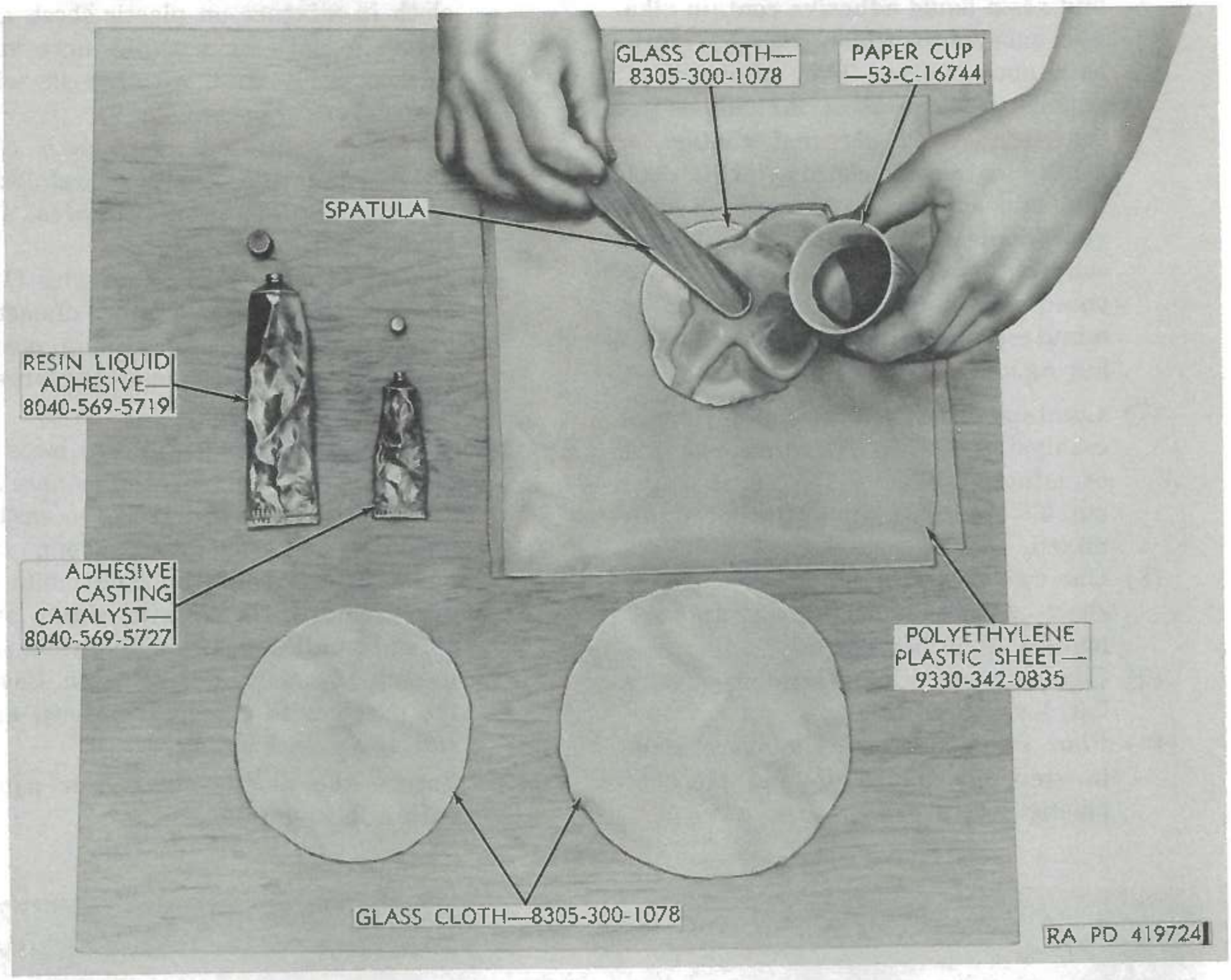


Figure 150 (U). Preparing patch for cover assembly (radome) (U).

(3) Apply multiple layers (maximum of four) of pressure-sensitive adhesive tape 8135–034–7929 to the damaged area. Extend adhesive tape at least 2 inches beyond the edges of the damaged area. Avoid excessive handling of the adhesive surface of the tape.

(4) If they have been removed, install acquisition antenna and IFF equipment (if applicable) as prescribed in TM 9–1430–251–10/1.

b. Permanent Repair.

(1) Remove IFF equipment (if installed) and acquisition antenna as prescribed in TM 9–1430–251–10/1.

Caution: **Do not use the waveguide from the auxiliary antenna subassembly as a handhold.**

(2) Remove cover assembly (radome).

(3) Remove the temporary patch, if installed.

(4) Sand the damaged area with abrasive paper 5350–271–7932 until all paint is removed and the surface is smooth.

(5) Clean the damaged area with trichloroethane 6810–664–0387.

(6) Cut three pieces of glass cloth 8305–300–1078 (fig. 150) approximately 4, 5, and 6 inches in diameter, respectively.

Warning: **Adhesive casting catalyst and resin liquid adhesive contain alkaline substances which may harm the skin upon contact. They also give off vapors to which some individuals are sensitive. Avoid personal contact or contamination of clothing with catalyst and adhesive, and work in well-ventilated area. In case of accidental contact or contamination, wash exposed skin immediately for at least 15 minutes; launder clothing before wearing again.**

(7) Combine the contents of one tube of catalyst 8040-569-5727 and one tube of adhesive 8040-569-5719 in paper cup 53-C-16744; stir until thoroughly mixed.

(8) Cut two pieces of polyethlene plastic sheet 9330-342-0835 each approximately 10 inches square.

(9) Lay both pieces of plastic sheet on a flat, level surface.

(10) Pour small amount of mixture made in step (7) above on one piece of plastic sheet.

(11) Place a 4-inch diameter piece of glass cloth in mixture on plastic sheet, and saturate cloth by pouring more mixture over it and working in with spatula.

(12) Lift the saturated glass cloth (fig. 151) from the plastic sheet with spatula, apply to damaged area, and smooth with spatula.

(13) Repeat steps (10) through (12) above with 5-inch and 6-inch diameter pieces of glass cloth, alining pieces concentrically, and placing the largest piece on top.

(14) Cover the patch with unused piece of plastic sheet, and rub the surface of the plastic sheet with a rag to ensure uniform adhesion throughout the patch. If the patch appears white or dry, remove the plastic sheet, and spread small amount of mixture made in step (7) above on the patch. Cover the patch with the plastic sheet, and rub again with a rag.

(15) Secure the plastic sheet over patch with adhesive tape.

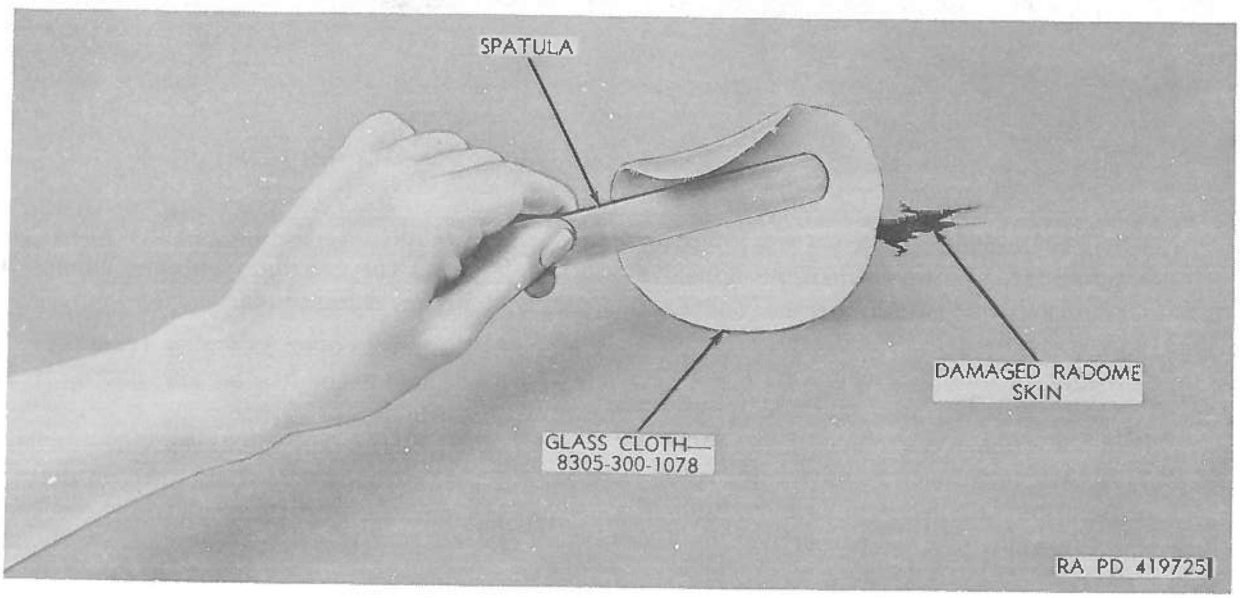


Figure 151 (U). Applying glass cloth to cover assembly (radome) (U).

(16) Apply pressure to the patch by placing a weight on the plastic sheet.

(17) If the cover assembly temperature is below 50 degrees F, apply heat to the patch area (not greater than 200 degrees F) until the area is at room temperature (75 degrees F). A 100-watt light bulb may be used for this purpose.

Note. If tactical conditions do not permit delay, the cover assembly and acquisition antenna may be installed and placed in operation immediately.

(18) After the patch has hardened, remove the adhesive tape and plastic sheet.

(19) Paint the cover assembly (radome).

(20) Install the cover assembly (radome).

(21) Install the acquisition antenna and IFF equipment (if applicable) as prescribed in TM 9-1430-251-10/1.

Section X (U). CORRECTIVE MAINTENANCE OF THE TRACK ANTENNA RADOME

229 (U). General

Any damage to the radome must be repaired immediately to prevent foreign matter from damaging the antenna. Repairs should be made using adhesive kit 9976249.

Note. Adhesive kit 9976249 should be replaced every 6 months.

230 (U). Repairs to the Track Antenna Radome

Note. The patch should be applied to the inside surface of the radome and should never result in more than one additional thickness of fabric. It is recommended that the total area of the patch or patches on one radome should not exceed 4 square feet.

a. Clean surfaces to be bonded with acetone and allow to dry thoroughly.

b. Spread an even coat of cement on each surface to be bonded and allow to air-dry for 1 hour.

c. Press cemented surfaces together. Do not move the surfaces for at least 24 hours.

Section XI (U). SERVICING OF OIL-FILLED VARIABLE RESISTORS

231 (U). General

Contamination of the oil used in the azimuth, elevation, and range variable resistors in the missile tracking, target tracking, and target ranging radar systems is a problem of vital importance. Variable resistors, like all precision equipment, must operate in an uncontaminated environment or suffer short life as a consequence. Strict cleanliness must be followed in handling the filling equipment and in performing the filling and draining procedures. Contamination must be controlled by the personnel responsible for these operations.

232 (U). Servicing Instructions

The procedures prescribed in chapter 4 in TM 9-1430-253-20 and LO 9-1430-250-20 will be followed in filling and draining the azimuth, elevation, and range variable resistors. In addition, the following instructions will be utilized:

a. All oil used in the variable resistors will be electrical insulating oil (Bayol D). The following Federal stock numbers apply:

FSN 9160-663-1360 (1 qt)
FSN 9160-663-9841 (1 gal)
FSN 9160-663-9837 (5 gal)

b. Clean the fill or drain equipment before connecting it, using clean electrical insulating oil.

c. The correct oil level is at the center of the oil-view window.

233 (U). Storage and Use of Servicing Equipment

The following precautions must be observed by all personnel concerned:

a. Store all filling equipment in a dustproof container, such as a plastic bag, and seal when not in use.

b. Cover the ends of all oil-filled hoses not in use. Use clean foil or its equivalent.

c. Tag the oil-fill can and all oil-fill equipment, stating that it must be used for its in-

tended purpose only. If any oil other than electrical insulating oil (Bayol D) is used in this equipment, clean the equipment thoroughly with clean electrical insulating oil.

d. Check all oil-fill cans, including new ones, for contamination such as rust, corrosion, etc. If contamination is found, do not use the oil from the contaminated cans.

e. Clean the equipment immediately after performing the fill or drain procedure. Use clean electrical insulating oil. Dry with a clean lint-free cloth.

(Next numbered page is 405)

APPENDIX II (U)

LIST OF ABBREVIATIONS (U)

All abbreviations used in this manual are listed alphabetically below.

I–HE	NIKE I high explosive warhead
A	ampere, azimuth
AADCP	Army Air Defense Command Post
AAR	auxiliary acquisition radar
AC	alternating current
ac	alternating current
ACKNOW	acknowledge
ACQ	acquisition
ADJ	adjust
AFC	automatic frequency control
A_G	gyro azimuth
AGC	automatic gain control
A–HE	AJAX high explosive warhead
AID	aided
AJAC	anti-jam avoidance capability
AJD	anti-jam display
AJI	anti-jam improvement
al	aluminum
AM	amplitude
AMP	amplitude, amplifier
AMPS	amperes
ANT	antenna
AR	Army Regulations
A/R	azimuth/range
ASP	annual service practice
assy	assembly
ATBM	anti-tactical ballistic missile
ATC	automatic tracking control
ATTEN	attenuation
AUTO	automatic
AUX	auxiliary
AZ	azimuth
AZS	automatic zero set
B	ballistic
BAL	balance
BARO	barometric
BAT	battery
BCO	battery control officer
B–HE	NIKE–HERCULES high explosive warhead
BLK	black
BO	burst order
BTE	battery terminal equipment
BTRY	battery
BWO	backward wave oscillator
B–XL	NIKE–HERCULES nuclear warhead, large
B–XS	NIKE–HERCULES nuclear warhead, small
B–XW	NIKE–HERCULES nuclear warhead
CAB	cabinet
CAL	calibration
cap.	captive
CARR	carrier
CCW	counterclockwise
ccw	counterclockwise
cd	cadmium
CENT	center
CHANN	channel
CHK	check
CKT	circuit
CLU	cluster
COL	collector
COMP	computer
CONT	control
CONUS	Continental United States
corr	corrosion
CPS	cycles per second
cps	cycles per second
CRT	cathode ray tube
CTR	center, centering
CUR	current
CW	clockwise, continuous wave
cw	clockwise
CY	cycle
DA	Department of the Army
MWO	Modification Work Order
DB	decibel
db	decibel
DC	direct current
dc	direct current
DCR	decrease
DEC	decrease
DECR	decrease
DESIG	designate
DEV	deviation
DF	dicke-fix
dia	diameter
DIF	difference
DIV	division
DN	down
DO	dive order
DYN	dynamic
E	east
ECCM	electronic counter-countermeasures
ECM	electronic countermeasures
EFS	electronic frequency selection
EL	elevation
ELEV	elevation
EQPT	equipment
EXC	excitation
EXP	expansion
EXT	external
F	Fahrenheit
FDT	final dive time
fig.	figure

FIL	filament
fil	fillister
fl	flat
FM	field manual
FREQ	frequency
FS	full scale
FSM	frequency shift modulated
FSN	federal stock number
ft	feet
FUIF	fire unit integration facility
G	gravity
GALV	galvanometer
GB	glide bias
GCO	guidance cutoff
GEN	generator
GND	ground
G_P	pitch acceleration order
grad	graduate, graduation
grn	green
G_T	turn acceleration order
GTC	gain time constant
G_Y	yaw acceleration order
H	horizontal
H	up-down distance of target from missile in yards
H_D	height displacement
hd	head
hdl	handle
HEL	helix
HERC	HERCULES
hex	hexagon
H-HE	HERCULES high explosive warhead
HI	high
HIPAR	high power acquisition radar
HOR	horizontal
HP	high power
H_{SL}	height stylus left
H_{SR}	height stylus right
HT	height
H_T	height of target
H_{TT}	height of target tracking radar
HV	high voltage
HW	handwheel
H-XL	HERCULES nuclear warhead, large
H-XS	HERCULES nuclear warhead, small
id	inside dimension
IF	intermediate frequency
IFF	identification friend or foe
I-HE	AJAX high explosive warhead
ILLUM	illumination
IMPR	Improved
in.	inch
INC	increase
INCR	increase
IND	indicator
INH	Improved NIKE-HERCULES
INT	intensity, internal
INTLK	interlock
IS	interference suppressor
JS	jam strobe
KC	kilocycle

kc	kilocycle
KV	kilovolt
kw	kilowatt
L	long, left
LA	low altitude (mission)
LCHR	launcher
LEC	low elevation compensation
LG	length
lg	long, length
LIN-LOG	linear logarithmic
LO	Lubrication Order
LOC	local
LOPAR	low power acquisition radar
LP	long pulse
M^2	square meters
MA	milliampere
ma	milliampere
MAG	magnetron
MAN	manual
MAX	maximum
max	maximum
MAX ϕ_L	maximum guidance cutoff angle
MBA	minimum burst altitude
MC	megacycle
mc	megacycle
MEAS	measurement
megw	megawatt
MIN	minimum
MOD	modulator, modulated
ms	millisecond
MSEC	microsecond
MSL	missile
mtd	mounted
MTI	moving target indicator
MTR	missile tracking radar
MV	multivibrator
N	north
NB	NIKE B
ni	nickel
no.	number
NOR	normal
NORM	normal
NVTS	null voltage test set
ϕ_L	launcher cutoff angle
OPR	operate, operation
ORD SNL	Ordnance standard nomenclature list
OSC	oscillator
oz	ounce
P	pitch, problem
PAN	panoramic
para	paragraph
PCM	pulse code modulated
PED	pedestal
PH	phase
PI	precision indicator
pltd	plated
PLX	parallax
POS	position
P-P	pulse to pulse
PPI	plan position indicator
pps	pulses per second

PREP	prepared
PRF	pulse repetition frequency
PROB	problem
PROC	processor
PWR	power
R	range, right
RBS	radar bomb scoring
RCDC	radar course directing central
RCT	remote control tracking
RCVR	receiver
REC	receiver, recorder
RECT	rectifier
REF	reference
REG	regulated
REL	release
REM	remote
REP	repetition
REQ	request
RES	reservoir
res	resistance, resistant, resistor
RF	radio frequency
RG	range
R_g	range
R_L	launcher-to-target radar plane range
RNG	range
RPM	revolutions per minute
rpm	revolutions per minute
RS	roll stabilization
R_s	true ground distance TTR-to-target
RSG	radar set group
S	south, steel
SA	surface-to-air (mission)
SEC	second, section
SEL	select
SENS	sensitivity
SF	scale factor
shk	shank
Si	angle of sight
SIF	selective identification feature
SIG	signal
SMLT	submissile lost time in seconds
S/N	signal to noise ratio
SOP	standard operating procedure
SP	short pulse
SS	surface-to-surface (mission)
STC	sensitivity time control
STDBY	standby
SW	sweep, switch
SWP	sweep
SYN	synchronizer
sync	synchronizing
SYS	system
TAC	tachometer
TACH	tachometer
TB	technical bulletin
T_D	dead time
TERM	terminal
TGT	target
thk	thick
THY	thyratron
TM	technical manual
TRANS	transmitter
TRIG	trigger
TRR	target ranging radar
T_{SLR}	time stylus left and right
TST	test
TT	transit time
TTC	target radar control console
TTR	target tracking radar
TWT	traveling-wave tube
UHF	ultra-high frequency
UNREG	unregulated
V	volt, voltage
v	volt
VAR	variable
var	variable
VC	velocity correction
VEL	velocity
VENT.	ventilation, ventilator
VERT	vertical
VID	video
W	west
w	watt, wide, with
X	east-west
X_{SL}	servo circuit that drives the left arm of the horizontal plotting board
X_{SR}	the servo circuit that drives the right arm of the horizontal plotting board
XTAL	crystal
Y	north-south, yaw
YD	yard
yds	yards
Y_{SL}	servo circuit that drives the left pen carriage of horizontal plotting board
Y_{SR}	servo circuit that drives the right pen carriage of the horizontal plotting board
zn	zinc

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